157

Russell Thacker

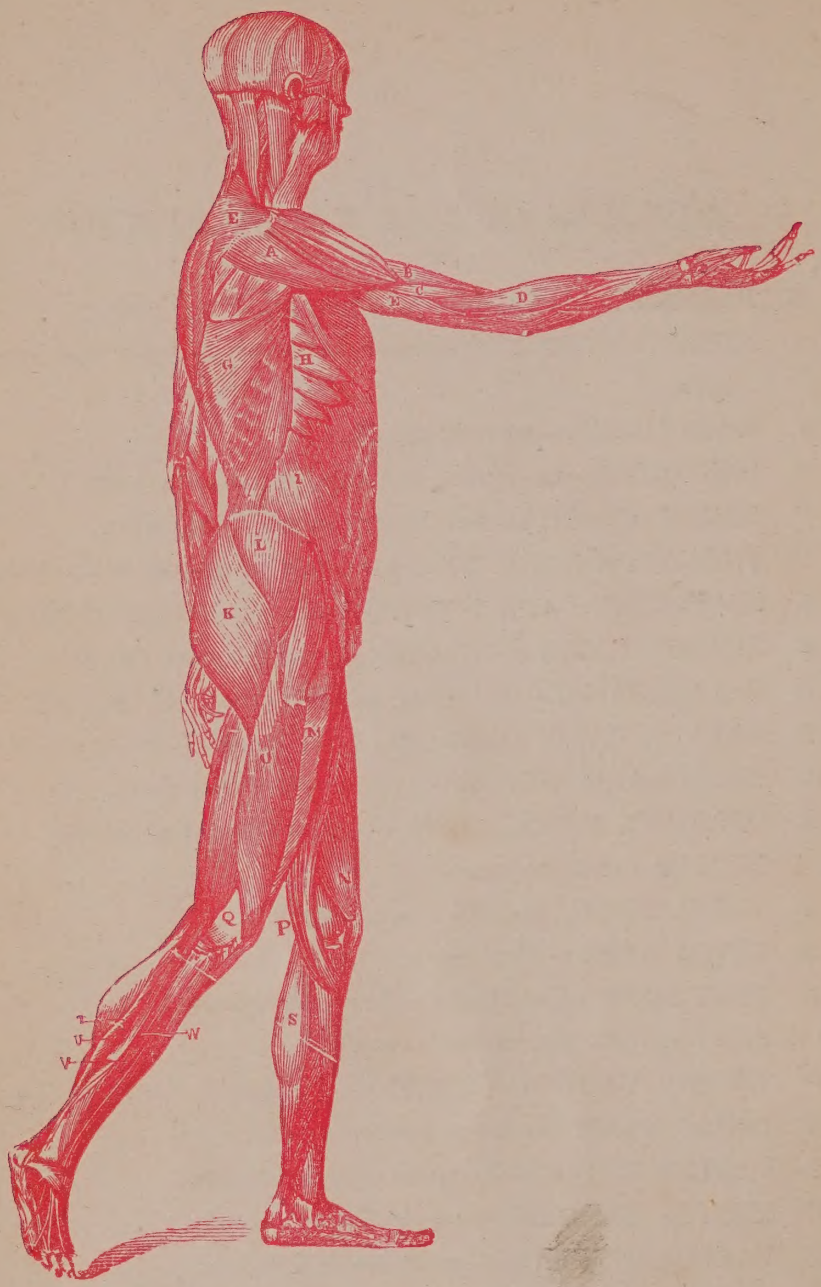
THE

HYDROPATHIC ENCYCLOPEDIA.

MUSCLES OF THE FRONT FIGURE.

MUSCLES OF THE FRONT FIGURE.

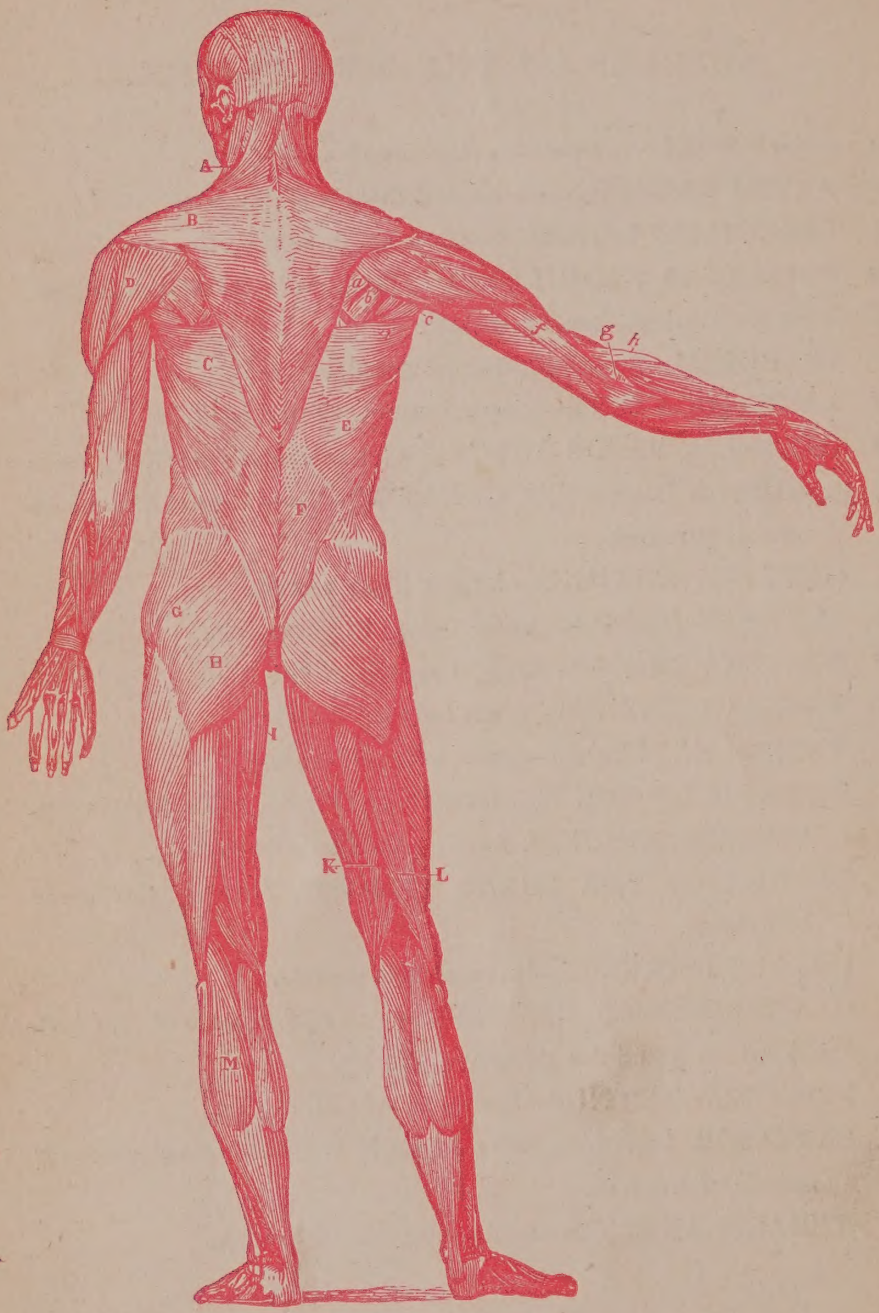
A PLATISMA MYOIDES—broad muscle of the neck.
a STERNO-HYOIDEUS—muscle between the breast and tongue bones.
b MASTOIDEUS—mastoid muscle.
B DELTOIDES—the muscle covering the shoulder-joint.
C BICEPS BRACHII—two-headed muscle of the arm.
D PRONATOR RADII TERES—pronating muscle of the arm.
E SUPINATOR RADII LONGUS—supinating muscle of the arm
F FLEXOR CARPI RADIALIS—radial flexor of the wrist.
G PALMARIS LONGUS—long bending muscle of the hand.
H FLEXOR CARPI ULNARIS—ulnar flexor of the wrist.
I PECTORALIS MAJOR—large muscle of the chest.
K OBLIQUUS DESCENDENS—oblique descending muscle.
L L RECTUS—straight muscle.
L LINEA SEMILUNARIS—semilunar line.
M LINEA ALBA—white line.
N POUPART'S LIGAMENT—Poupart's ligament.
O O SARTORIUS—the "tailor's muscle."
P TENSOR VAGINÆ FEMORIS—stretcher of the fascia lata
U PSOAS MAGNUS—large lumbar muscle.
V VASTUS EXTERNUS—great external muscle.
W RECTUS FEMORIS—straight femoral muscle.
X VASTUS INTERNUS—great internal muscle.
Y GASTROCNEMIUS—muscle of the calf of the leg.
y SOLEUS—a broad flat muscle of the leg.
Z TIBIALIS ANTICUS—anterior muscle of the leg.



MUSCLES OF THE SIDE FIGURE.

MUSCLES OF THE SIDE FIGURE.

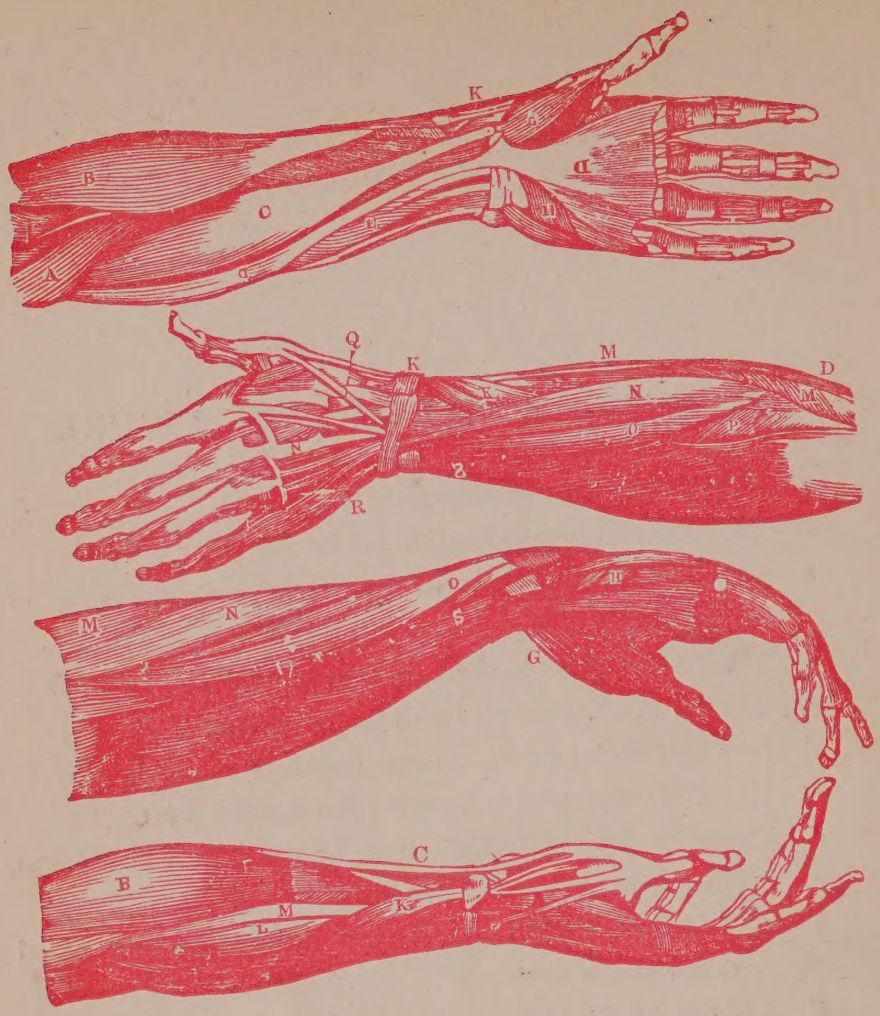
A DELTOIDES—muscle covering the shoulder joint.
B BICEPS BRACHII—two-headed muscle of the arm.
C BRACHIALIS INTERNUS—internal muscle of the arm.
D SUPINATOR RADII LONGUS—long supinator of the radius.
E TRICEPS—three-headed muscle.
F TRAPEZIUS—trapezium-shaped muscle.
G LATISSIMUS DORSI—lateral muscle of the back.
H SERRATUS MAJOR ANTICUS—large serrated anterior muscle.
I OBLIQUUS DESCENDENS EXTERNUS—external oblique descending muscle.
K GLUTÆUS MAXIMUS—largest thigh muscle.
L GLUTÆUS MEDIUS—middle-sized thigh muscle.
M RECTUS FEMORIS—straight muscle of the thigh.
N VASTUS INTERNUS—great internal muscle.
O VASTUS EXTERNUS—great external muscle.
P TENDONS OF THE SEMIMEMBRANOSUS AND SEMITENDINOSUS MUSCLES, forming the inner hamstring.
Q TENDON OF THE BICEPS FEMORIS, forming the outer hamstring.
R ILIACUS INTERNUS—internal iliac muscle.
S GASTROCNEMIUS EXTERNUS—external muscle of the calf.
T SOLEUS—a broad flat muscle of the leg.
U PERONEUS TERTIUS—fibular muscle of the leg.
V EXTENSOR LONGUS DIGITORUM PEDIS—long extensor muscle of the toes.
W TIBIALIS ANTICUS—anterior muscle of the leg.



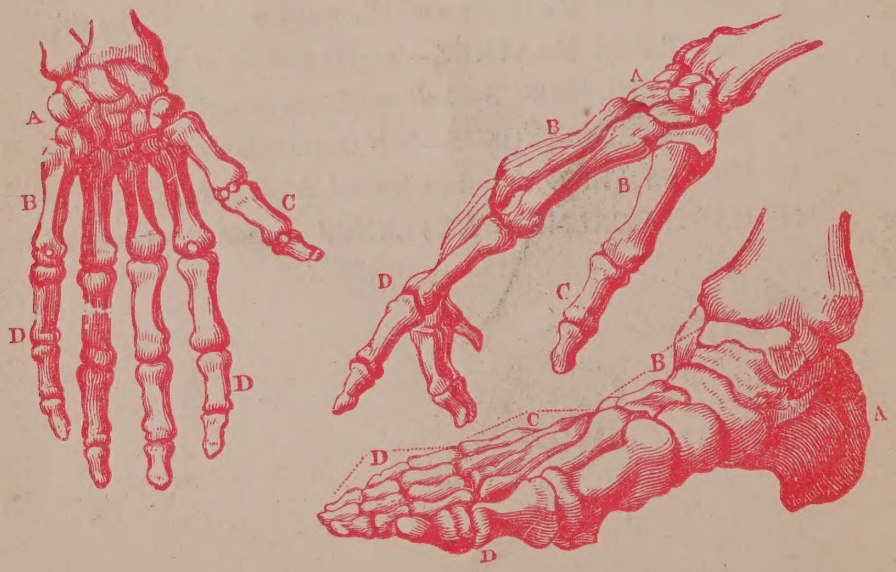
MUSCLES OF THE BACK FIGURE.

MUSCLES OF THE BACK FIGURE.

A MASTOIDEUS—mastoid muscle.
B TRAPEZIUS—trapezium-shaped muscle.
a INFRA SPINATUS—the muscle beneath the spine of the scupula.
b TERES MINOR—long round smaller muscle.
c TERES MAJOR—long round larger muscle.
C LATISSIMUS DORSI—lateral muscle of the back.
D DELTOIDES—muscle covering the shoulder-joint.
f TRICEPS BRACHIALIS—three-headed muscle of the arm.
g ANCONEUS—muscle of the elbow.
h EXTENSOR CARPI RADIALIS LONGUS—long radial extensor of the wrist.
E SACRO LUMBALIS—muscle of the sacrum and loins.
F LONGISSIMUS DORSI—long muscle of the back.
G GLUTÆUS MEDIUS—middle-sized muscle of the thigh.
H GLUTÆUS MAXIMUS—largest muscle of the thigh.
I SEMITENDINOSUS—half-tendinous muscle.
K SEMIMEMBRANOSUS—half-membranous muscle.
L BICEPS FEMORIS—two-headed thigh muscle.
M GASTROCNEMIUS EXTERNUS—external muscle of the calf.



MUSCLES OF THE FOREARM



BONES OF THE HAND AND FOOT.

MUSCLES OF THE FORE-ARM AND HAND.

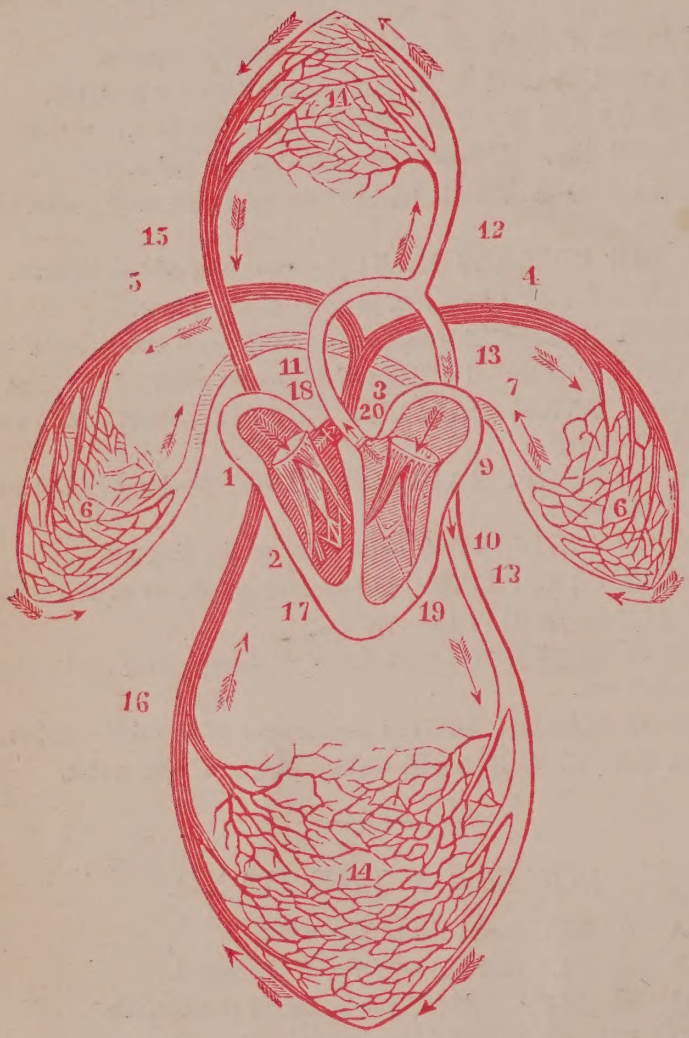
A PRONATOR TERES—long round pronator muscle.
B SUPINATOR RADII LONGUS—long radial supinator.
C FLEXOR CARPI RADIALIS—radial flexor of the wrist.
D PALMARIS LONGUS—long muscle of the palm.
E PERFORATUS, & PERFORANS—perforated, and perforating muscles.
G ABDUCTOR POLLICIS MANUS—abductor of the thumb.
H PALMARIS BREVIS—short muscle of the palm.
K EXTENSOR POLLICIS—extending muscle of the thumb.
K EXTENSOR PRIMI INTERNODII—extensor of the first finger
L EXTENSOR CARPI RADIALIS BREVIS—short radial extensor of the wrist.
M EXTENSOR CARPI RADIALIS LONGUS—long radial extensor of the wrist.
N EXTENSOR DIGITORUM—extensor of the fingers.
O EXTENSOR CARPI ULNARIS—ulnar extensor of the wrist.
P ANCONEUS—muscle of the elbow.
Q EXTENSOR SECUNDI INTERNODII—supinator and extensor of the thumb.
R EXTENSOR MINIMI DIGITI—extensor of the little finger.
S FLEXOR CARPI ULNARIS—ulnar flexor of the wrist.

BONES OF THE HAND.

A CARPUS—bones of the wrist.
B METACARPUS—bones of the hand.
C DIGITUS PRIMUS—bones of the thumb.
D PHALANGES—bones of the fingers.

BONES OF THE FOOT.

A OS CALCIS—heel-bone.
B TARSUS—bones of the instep.
C METATARSUS—bones of the foot.
D PHALANGES—bones of the toes.



PURIFICATION OF THE BLOOD.

PURIFICATION OF THE BLOOD.

The figure is an ideal view of the circulation in the lungs and system. From the right ventricle of the heart (2), the dark, impure blood is forced into the pulmonary artery (3), and its branches (4, 5), carry the blood to the left and right lung. In the capillary vessels (6, 6) of the lungs, the blood becomes pure, or of a red color, and is returned to the left auricle of the heart (9) by the veins (7, 8). From the left auricle the pure blood passes into the left ventricle (10). By a forcible contraction of the left ventricle of the heart, the blood is thrown into the aorta (11). Its branches (12, 13, 13) carry the pure blood to every organ or part of the body. The divisions and subdivisions of the aorta terminate in capillary vessels, represented by 14, 14. In these hair-like vessels the blood becomes dark colored, and is returned to the right auricle of the heart (1) by the vena cava descendens (15) and vena cava ascendens (16). The tricuspid valves (17) prevent the reflow of the blood from the right ventricle to the right auricle. The semilunar valves (18) prevent the blood passing from the pulmonary artery to the right ventricle. The mitral valves (19) prevent the reflow of blood from the left ventricle to the left auricle. The semilunar valves (20) prevent the reflow of blood from the aorta to the left ventricle.

To effect the complete purification of the whole mass of blood, in an adult of ordinary size, requires a pint of atmospheric air to be taken into the lungs at each inspiration; and as the usual number of inspirations is about eighteen per minute, the daily supply amounts to three thousand two hundred and forty gallons, or one hundred and thirty-five gallons per hour.

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PREFACE

In the infancy of a system, so comprehensive in its principles and so multitudinous in its details as to embrace all the laws of hygiene, and all the facts of anatomy, physiology, and organic chemistry, it can hardly be expected that its literature will be otherwise than crude and incoherent.

Of the many valuable works extant on Water-Cure, no one embodies all the departments of science relating to the cure of disease and the preservation of health, into a consistent and philosophical system; nor do all of them together treat of, or even mention, the majority of subjects or diseases inseparably connected with, and forming parts of a complete plan of hydro-therapeutics.

In attempting to supply this desideratum, the author has, through the kindness and liberality of the publishers, been enabled to avail himself of nearly all that has been published in this country and Europe directly or remotely connected with Hydropathy, as well as an extensive range of private correspondence, and written but unpublished experience in domestic practice.

The great number of topics embraced in the scope of the work, rendered the utmost brevity of language indispensable; hence, in advancing new doctrinal propositions, and in controverting positions deemed erroneous, but little space was left for details an explanations.

For imperfections in style and arrangement, the only available apology is, the many cares incident to the medical direction of two hydropathic establishments during the whole time occupied in the preparation of the work.

NEW YORK, 15 *Laight Street*, 1855.

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INTRODUCTION.

BEFORE the prevailing medical practice can be revolutionized, and a system introduced at variance with established usages—in direct antagonism with the general habits, customs, education, and prejudices of the people; in utter contempt of the teachings and practices of great and venerable names, and opposed to the pride, interest, reputation, and even conscientious convictions of a learned, honorable, and influential profession—the intelligent portion of the community will demand reasons the most profound and evidences the most conclusive, while the illiterate will require an accumulation of facts and details absolutely overwhelming.

The philosophy of life and health, the laws of the human organism, and its relations to surrounding nature, have been, in my judgment, already sufficiently demonstrated to satisfy the intellectual mind of the former class, and their application to the preservation of health and cure of disease amply demonstrated by actual experiment for the exercise of the faith of the latter class. All that seems necessary now, in order to achieve that great reform in human society, which shall restore to the individuals who compose it "sound minds in sound bodies," and that exalted state of happiness which human nature is susceptible of, even in this world, is, to commend these great truths to the thoughts and feelings of human beings in such a manner that they shall be exemplified in their lives.

A short sketch of the origin and progress of what is called medical science will exhibit the baseless fabric we are laboring to demolish; and a brief review of the history of bathing, as it has been employed remedially in all ages of the world, will prove that the Water-Cure, though in its infancy as a system of the healing art, has had, in all its essentia particulars, the sanction of the most learned men of all professions in

all ages. These topics, therefore, present themselves as forming a pertinent introduction to this work.

Many of the historical data relative to these subjects are collected from Bostock's History of Medicine and Bell's work on Baths and the Water Regimen. In the application and generalization of these data, and in relation to the principles to which they refer, I have, however, differed often and widely from these authors.

HISTORY OF MEDICINE.

Writers generally agree that medicine first became a profession among the Egyptians. Its origin, however, is involved in fabulous and impenetrable obscurity. In Egypt and in most of the earlier nations the priests were the practitioners of the healing art; and unfortunate was it for the human race when medicine was "elevated to the dignity of a distinct profession." To me the priest appears to be the proper person to teach the body as well as the soul "the straight and narrow way." The functions of mind and body are so intimately related, all the powers of the one and organs of the other constantly acting and reacting on each other, that I cannot imagine how it is possible for the spiritual or physiological teacher to do full justice to man in either relation of his existence without understanding the laws of both. Nay, I would have the same person exercise the function of priest, doctor, lawyer, and schoolmaster; and that individual who can present to his fellow-creatures the most harmonious whole of a human being—who can best teach in theory, and most faithfully exemplify in practice, the laws of being in his moral, physiological, legal, and social relations, should belong to *the* learned profession and be a leader among men.

The Earliest Ancient Physicians.—The Egyptian priests practiced the healing art by means of magical incantations, which, of course, produced their good or bad impressions through the medium of the imagination, the efficacy of their prescriptions bearing a pretty exact ratio to the superstition and credulity of their patients. The medical practice of the Assyrian priests consisted mainly of magical arts, while the actual learning they possessed was carefully concealed in a mystical technicality. Among the early Jews the priests, who were the physicians also, treated the leprosy and other diseases with various ceremonies to affect the imagination, at the same time enforcing judicious regulations to avoid the sources of contagion, and promote personal cleanliness.

The Early Grecian Physicians.—In Greece the genius of Hip-

pocrates first caused medicine to be regarded as a science, though Chiron, who lived about 1300 B.C., is accredited for having introduced the healing art to his countrymen. Æsculapius, a pupil of Chiron, is considered the first person who made medicine an *exclusive* study and practice. His sons, Machaon and Podalirius, are celebrated in Homer's Iliad for their medical skill, though, as they were employed principally as surgeons in the Greek armies, their medication was doubtless mostly confined to crude yet simple methods of dressing wounds and recent injuries, which were exceedingly common in that warlike age. The descendants of Æsculapius, called Asclepiadæ, were the priests of the temples; and the temples were the hospitals to which the sick were brought, where the priests performed numerous imposing ceremonies to inspire confidence, and gave various directions conducive to temperance, cleanliness, and simplicity of diet. The temples were located in the most salubrious places, and in them frequent ablutions were recommended for the sick; these were, no doubt, the real curative agencies.

We have no knowledge that Æsculapius, or his immediate successors, ever conceived the idea of curing diseases by drugs administered internally. Ablutions, bandages, fomentations, ointments, mechanical support, and the application of balsamic and astringent herbs, with the occasional use of wine or other stimulating substances, constituted their whole and their ample materia medica; and these were all employed *externally*.

THE DOGMATIC AND THE EMPIRICAL PHYSICIANS.—For several centuries succeeding the age of Æsculapius and his sons, we have no records that medicine made the least progress. Numerous temples were erected in honor of Æsculapius, who was deified as the god of medicine; and in these temples a practice obtained among the patients of recording on a tablet, for the benefit of others, a statement of their diseases and the means by which they were relieved, thus converting the temples into schools of medicine. But then there were men of superior sagacity and inordinate selfishness, who desired to turn the common knowledge to individual advantage. The temples of Cos and Gnidos became rival establishments. One assumed to be philosophical, by uniting reason with experience, while the other professed to be governed solely by facts and observations. Thus arose two medical sects—the Dogmatists and the Empirics, who long divided the medical world, and whose influence is not yet extinct, for we find at this day many physicians who follow wherever theory leads, regardless of facts or consequences: and another set of practitioners who are merely

routine imitators, without a particle of pretension to any rational system.

Medical Philosophers.—Pythagoras, in the sixth century before Christ, was the pioneer of a class of scholars of general information and philosophical mind, who gave much attention to the investigation of the structures, functions, and diseases of the human body. He established a school at Crotona, to which students resorted from most parts of Greece and Italy. More than twenty years of his life were spent in Egypt, Chaldea, and Eastern Asia, and he prosecuted the study of comparative anatomy by dissecting animals. His pupils were not exclusively devoted to medical studies, but were among the men most celebrated for general erudition in that and in the succeeding age. Among the most illustrious of his followers were Democritus and Heraclitus, the former being regarded as the first person who attempted the dissection of a human subject. Acron is mentioned by Pliny as among the first who undertook to apply philosophical reasoning to medicine. Herodicus is considered the inventor of gymnastic exercises, which the Greeks regarded as an important branch of the healing art.

Hippocrates.—One of the most sagacious, observing, and industrious men that ever lived was the "Coan Sage," who has been entitled the "Father of Medicine." Hippocrates was a pupil of Herodicus, brought up among the Asclepiadæ, in the temple of Cos. He traveled much in foreign countries, devoting himself to the study and practice of medicine with untiring energy, and his works became text-books for many ages; even to this day his leading doctrines are extensively recognized. His practice has been called a rational empiricism; in other words, a careful observation of facts, and a reasoning process based upon their consequences. His first philosophical proposition regarded fire as the primitive source of all matter, the four elements being a result of the collision and combination of its ever-moving particles; and his leading physiological proposition was, the existence of a general presiding principle of vitality for the whole body, and a special vital power in each organ. If we substitute the modern term, electricity, for his "fire," and the modern phrases, organic sensibility, and special centre of organic perception, for what he calls "nature" and "power," we shall very nearly harmonize his ideas with those entertained by some of the ablest living physiologists. His doctrine that the fluids were the primary seat of disease was never disputed, save by some small factions of medical men, until about the commencement of the eighteenth century; and even now it has at least as many advocates as

opponents. In his system the combinations of the four elements of fire, air, earth, and water, with their four qualities of hot, cold, moist, and dry, gave rise to the four humors of the body, blood, phlegm, bile, and black-bile, which originally tended to produce the four temperaments, and which in their turn contributed to the excess or defect of each of the humors. These speculations, crude and fanciful as they may be, at least indicate a powerful tendency in the mind to analyze and systematize.

The doctrine of crises originated with Hippocrates. He noticed that fevers evinced a tendency to terminate on particular days, which he called critical; and he observed that there is a tendency in all diseases to a cure by some eruption or evacuation. His practice was consistently founded on the indications presented by these phenomena. Modern physicians have been most unfortunate in overlooking or disregarding these fundamental truths, which happily are now being re-established by the water-treatment. His materia medica was derived wholly from the vegetable kingdom, the horrid chemicals, metallic salts and oxides, acids, and spirituous compounds, which have since "demonstrated the efficiency of our arms," in killing pain and patients, being then unknown. Purgatives, sudorifics, diuretics, and injections were his principal internal remedies, while externally he employed bleeding, issues, ointments, plasters, and liniments. The following extract from Bostock shows a remarkable congruity between the leading practical idea of Hippocrates, and the doctrine universally acted upon by hydropathic practitioners:

"The great principle which directed all his operations was the supposed operation of 'nature,' in superintending and regulating all the actions of the system. The chief business of the physician is to watch these operations, to promote or suppress them according to circumstances, and perhaps, in some rare cases, to attempt to counteract them. The tendency of this mode of practice would be to produce extreme caution, or rather inertness, on the part of the practitioner, and we accordingly find that Hippocrates seldom attempted to cut short any morbid action, or to remove it by any decisive or vigorous treatment. Considering the state of knowledge on all subjects when he lived, it must be admitted that this plan of proceeding was much more salutary than the opposite extreme, and that it had likewise the good effect of enabling the practitioner to make himself better acquainted with the phenomena of the disease, and, by observing the unaided efforts of nature, to form his indications with more correctness, and to determine to what object he ought more particularly to direct his attention."

It must be admitted that the bleedings, active purgatives, the sweatings and diuretics of the Hippocratean practice were inert compared

with the more profuse bleedings of the moderns, and their hundreds of mineral poisons; but the constantly accumulating number of chronic diseases, and the greater fatality of acute, certainly favor the idea that our modern Æsculapians, though much *more powerful* doctors, are much *less successful* ones.

The First "Irregular" Physician.—Subsequent to the age of Hippocrates, medicine remained stationary for several centuries. His sons, Thessalus and Draco, his son-in-law Polybus, Diocles of Carystus, and Praxagoras of Cos, are the only names distinguished among his immediate successors One of their contemporaries was a Dr. Chrysippus, who opposed bleeding and the employment of active purgatives; he was, however, regarded as a sort of "irregular," who did not pay due deference to the authority of great names.

Plato and Aristotle, like most of the ancient Greek philosophers were conversant with the medical doctrines of their day, though not practicing physicians. The latter published the first works on anatomy and physiology, and all his writings, though full of refined vagaries, held a strong influence over the public mind for many centuries after his death.

The Alexandrian School.—The Ptolemies founded a medical school at Alexandria about 300 B.C. The most famous of its professors were Erasistratus and Herophilus, who dissected bodies of criminals obtained of government. Erasistratus, having been a pupil of Chrysippus, adopted his opinions against bleeding and violent remedies, professing to trust nature more and art less. Herophilus paid particular attention to the action of the heart, and was the first to give any thing like an accurate description of the various kinds of pulse.

Soon after the institution of the Alexandrian school a division of medical men occurred, by which the practice of physicians proper, or dietetics, and druggists, and surgeons, became distinct vocations; and not long after this event the great schism occurred which divided medical men into two sects, the Dogmatists and Empirics, already mentioned. All the medical men of the day, and for several succeeding ages, were attached to one or the other of these rival parties.

The Regulars Banished from Rome.—After the decline of Grecian literature, medicine, as a distinct pursuit, made no progress for a long time. During the warlike days of Rome, she was, for six hundred years, without a physician who made the healing art a profession. The superstitions and ceremonies of the Greeks were trans-

rted to Rome, and plagues and other epidemics were attempted to stayed by such rites as would propitiate the offended deities. Pliny tes that about two hundred years before the Christian era, the first gular physician, by the name of Arcagathus, established himself as a ctitioner at Rome. He was received at first by the people with spect and even reverence, but so severe was his practice, and so un-ccessful its results, that disgust succeeded admiration, and caused the zens to prohibit the practice by law, and banish its professors from land.

About a century after, Asclepiades, of Bithynia, a pupil of Epicurus, nt to Rome as a teacher of rhetoric. Being unsuccessful, he turned attention to medicine, by which he acquired great popularity. His ctice was very mild and cautious, and as he denounced with vehe-nce the harsh measures of some of his predecessors, he was then garded by his contemporaries, and is now by medical historians, as a t of irregular, or quack. He was the first to arrange diseases into classes of acute and chronic. His pupil, Themison, of Laodicea, nded a third medical sect, called the Methodic, who adopted a kind eclectic system, combining parts of the systems of the Dogmatists d Empirics. Like his master, his philosophical notions were mainly rived from Epicurus. Diseases he referred to states of contraction d relaxation, and remedies were divided into two classes, astringents d relaxants. The Methodic theory regards the solids as the primary t of disease, thus opposing directly the Hippocratic doctrine, or moral pathology.

The First Heroic Practitioner.—The next individual of note ose discoveries or vagaries have had an important bearing on medical ctice was Thessalus, who lived half a century later than Themison. pompous pretensions, swelling self-sufficiency, and abundant cun-ng, he acquired great reputation and wealth; he treated all his pre-cessors and contemporaries with the utmost contempt, and even took himself the modest title of the Conqueror of Physicians. He intro-ced a new method of medical treatment, called *metasynocrisis*, which, happily for mankind, has been too much followed by the medical rld. It consisted in producing an entire change in the state of the body, tead of merely regulating, correcting, and removing morbid actions and mptoms after the Hippocratic plan. It may possibly startle the non-edical reader to be informed that a principle so manifestly absurd, l promulgated by its author or fabricator for no other purpose than get gold and fame, was generally adopted by subsequent medical riters, and is now the principal corner-stone of orthodox medical

practice. Until the advent of Thessalus, the physicians were content to study the indications of nature, aid and assist her efforts, and remove obstacles in her way. Since his time faith in the integrity of nature has steadily declined, and reliance on the power of art as steadily advanced, until we behold a body of learned professors of the healing art sending the most deadly and destructive agents to ravage within the domain of vitality, heedless of, or faithless to, the great truth that nature, and nature alone, is the true physician.

Soranus and C. Aurelianus are the next Roman physicians of celebrity. They were strict Methodics, and their writings did much to advance the particular notions which they had imbibed; their remedial measures were, however, very mild, and hence generally successful. But it is worthy of especial remark, as evidence of the powerful influence of a preconceived theory over the exercise of judgment, that modern writers, who have generally adopted the heroic notions of Thessalus, condemn the practice of these Methodics for its want of vigor and promptness. Its success was no argument in its favor so long as it wanted power! Abstinence, the bath, frictions, and external applications were their leading remedial measures. Topical bleeding was also employed, though general blood-letting was rarely resorted to; narcotics and oleaginous applications were frequently used, and great attention paid to pure air; sometimes a moist air was enjoined.

The Pneumatics and Eclectics.—During the first two centuries of the Christian era the Methodic sect prevailed, yet the peculiar speculations of different individuals were gradually introduced, causing at length the formation of several subdivisions, or new sects, of medical practitioners, the most prominent of which were the Pneumatics and the Eclectics, or Episynthetics. Pneumatology and eclecticism are not therefore quite as modern notions as many have supposed.

The Pneumatics evidently had a glimpse of the true idea of vitality, yet were incapable of expressing it rationally. They taught that the human body was composed of solids, fluids, and spirits. Their ideas of the spiritual agency in the production and cure of disease were strikingly analogous to the modern doctrine of the nervous influence. The most eminent writer of this sect was Aretæus. His practice was more active and less expectant than that of the Methodics.

The most celebrated of the Eclectics was Archigenes, of Appamea, who practiced at Rome in the time of Trajan. His writings are extremely obscure and chimerical, yet he acquired great popularity and influence; perhaps he is as much indebted to the unintelligible character of his works as to any other circumstance for his fame.

Celsus is the first native Roman physician of whom we have any account. He wrote several books on medicine, which show that surgery and pharmacy had made considerable progress. It is difficult to class him with either of the sects of his day; in practice he pursued mainly the method of the Asclepiades. His origin, or the age in which he lived, are not precisely known, though it is conjectured that he lived in the reigns of Augustus and Tiberius.

The First Pharmacopœia.—In the reigns of Claudius and Nero a class of writers became famous by their pharmaceutical preparations. The most notorious among them were Scribonius Largus, who made a book of nostrums and indiscriminate formulæ, and Andromachus, who compounded a medicamentum of sixty-one ingredients. It was called the *theriaca*, and its most essential constituent, from which its name was derived, was the dried flesh of vipers! This preparation has since been recommended, by regular physicians, for almost every known disease, and was even retained in the pharmacopœias of the schools until the beginning of the present century. In fact, the cod-liver oil of this day has not been a greater hobby with modern physicians, than with the ancients was the viperous compound of Andromachus, who, for his marvelous learning and skill in mixing together the most incongruous articles in the most nonsensical manner, was honored with the title of Archiator, or Principal Physician—a title bestowed by the Roman emperors, and continued for several centuries.

Pliny, though not practically a medical man, was, nevertheless, familiar with all that was taught on the subject in his time. He represents the prevailing practice as essentially empirical, consisting of various vegetable and animal mixtures, administered with scarcely any inquiry whatever into their mode of operation.

Dioscorides was a distinguished author at the same period. An elaborate treatise which he wrote on materia medica was the standard production for many ages subsequently. It contains descriptions of all articles then employed in medicine, with an account of their supposed virtues, much more curious, however, than useful.

Galen.—The name and history of Galen are more familiar to modern practitioners of the healing art than are any other ancient physicians. Thoroughly educated in all the schools of philosophy, he selected from them all, except the Epicurean, which he totally rejected. He was a native of Pergamus, but, after traveling extensively, at the request of the Emperor Aurelius, settled in Rome. His works number nearly two hundred treatises on all subjects directly or remotely

connected with medicine. In the formation of opinions he was entirely independent, paying very little respect to authority; and so great was the reputation he acquired for learning, skill, and wisdom, that his opinions were regarded by many as oracles. In theory he was with the Dogmatists, and in practice he professed to venerate and act upon the principles of Hippocrates.

In Galen's time the Roman empire began to decline; and the general decay of science and literature in the middle ages succeeding, has left little to record in the shape of innovation. Sprenzel has pithily characterized the medical writers of the third and fourth centuries as "frigid compilers, or blind empirics, or feeble imitators of the physician of Pergamus." Oribasius, who lived in the fourth century, Aëtius in the fifth, and Alexander Trallianus and Paulus Ægina in the sixth, wrote books which professed but little more than to be compilations of, and commentaries on, the works of Galen

The Arabian School.—With the death of Paulus, about the middle of the seventh century, terminated the Greek school of medicine. The Arabians, who conquered a large portion of the semi-civilized world, destroyed the immense Alexandrian library, yet the Arabian physicians had adopted the opinions of Galen, and followed his practice implicitly. But a new school soon arose among them, owing to the invention of chemistry, and its being made subservient to medicine. One of the most celebrated Arabian physicians was Rhazes, born at Irak, in Persia, in the ninth century. His writings, though mostly comments on Galen and the Greek physicians, contain an original and elaborate treatise on the theory and treatment of small-pox and measles. In his writings on surgery and pharmacy are found indications of the employment of chemical remedies, which formed so important and so disastrous an era in medical history soon after.

After Rhazes flourished Ali Abbas, a physician and writer, who obtained the title of magician; and about a century later appeared on the stage Avicenna, who acquired a reputation among his countrymen not inferior to that of Galen. He was born at Bokhara, A.D. 980, and was carefully educated in the schools of Bagdat. His published works were numerous, and his "Canon Medicinæ," a kind of encyclopœdia of existing medical sciences, was the text-book in most of the Arabian, and even European, schools for several centuries.

Mesue the elder, Mesue the younger, and Albucasis were among the last Arabians of distinction who wrote much on medical subjects. Avenzoar, and his pupil Averroes, natives of Spain, wrote voluminously

in the Arabic language, and enjoyed great celebrity, but their works have added nothing substantial to those of their predecessors.

With Averroes terminated the Arabic or Saracenic school of medicine, the great reputation of which is mainly owing to the circumstance that, from the eighth to the twelfth centuries, when all Europe was sunk in deep barbarism, the principal remains of a taste for literature and science existed among the Moors and Arabs. Medical historians give the Arabians credit for having added many vegetable products, and a few metallic salts and oxides, to the catalogue of remedies. The spirit of the age, then, among those eminent in the profession—not unlike the spirit of the present day—was that of emulation in writing the greatest number of books, and finding out new substances which could be taken into the stomach and applied externally, and called medicines. The intelligent reader will not fail to perceive that thus far, in medical history, the merit of successful practice, amid all the conflicting notions that have by turns prevailed, is fairly attributable to hygienic regulations, particularly as regards diet and bathing; while the necromancy and the drugging may be regarded as having been accidentally useful or injurious, according to circumstances. This principle, which is the true key to the interpretation of medical testimony, will become more and more apparent as we proceed.

The Monks and Alchemists.—From the twelfth to the fifteenth centuries the practice of medicine, in those countries best known to us, was principally in the hands of the monks, whose healing resources were mainly drawn from magical arts and astrological superstitions. The mystery of this system enabled the practitioners to acquire an unbounded influence over the ignorant masses. Chemistry, or, rather, alchemy, was then prosecuted with much ardor, with the view of discovering a method of transmuting the baser metals into gold, and of preparing a universal medicine—conceits which seem to have been very generally entertained by the learned of that period; and the pursuit of them led to many experiments and the introduction of many chemical preparations into the materia medica, and, indeed, laid the foundation of the mineral drug system of the present day. Most of the alchemists and medical pretenders were knaves of the lowest character, or dupes of the most marvelous credulity, and a few were, according to Bostock, "compounds of knavery and folly."

The only medical schools of any note were the Neapolitan, of Monte-Cassino and of Salerno. The latter, which was the first to grant diplomas, maintained some reputation until eclipsed by those of Bologna and Paris, in the thirteenth century. About this time anatomy

was attentively studied by dissections. The first English physician of note was Anglicanus, who published a work in the early part of the fourteenth century, entitled, "Medicinæ Compendium," made up of trifling disquisitions on insignificant topics.

The European feudal system now began to be shaken by the crusades; Constantinople was captured by Mahomet the Second, about the middle of the fifteenth century; about thirty years after the ruin of the Byzantine empire the Reformation occurred; and about the same period the art of printing was invented; all of which events tended to give a powerful impulse to the world of mind, and re-awaken investigation in all the departments of science, literature, and the arts. Still, the great body of medical writers, for want of philosophical premises by which to direct scientific researches, and in utter destitution of all ascertained principles to which they could refer the facts developed by anatomical, pathological, and chemical knowledge, busied themselves in collecting, arranging, republishing, expounding, and commenting on the multitudinous works of Hippocrates and Galen. Their labors only tended to multiply books already too numerous, and mystify ideas already too confused.

The alchemic art was at length transferred from Arabia into the European countries, where it was pursued with as much assiduity as by the Arabs themselves. Medical chairs were established in various universities in Europe during the thirteenth century; medical lectures were given in the universities of Vienna and Paris, and schools were established in Padua, Pavia, Milan, Rome, and Naples. Linacre, who was educated at Oxford, spent some time in Italy and at the court of Florence, and on returning to England succeeded in establishing medical professorships at Oxford and Cambridge, and laid the foundation of the London College of Physicians.

The Chemical Physicians.—The next important event in medical history was the formation of the chemical sect. Chemistry, after having been employed in various pharmaceutical processes, was applied to physiology, pathology, and therapeutics; hence the origin of chemical doctors. The chemical physicians advanced their theories, which were as wild and extravagant as any preceding ones, with great boldness and assurance, and for a long time the Galenists and Chemists were the rival sects of the medical world. But the Galenists had an ever-present champion in the very name of Galen, who may well be called the Prince of Medical Philosophers. He *was* a philosopher—a *natural* philosopher; for he studied nature closely, deeply, profoundly, and deduced his principal indications of cure from an accurate observation of

her laws. But his system was destined to be overthrown by an adventurous vagrant, who, in all the mental, moral, and physical elements and proportions of a complete and thorough quack, never had his equal on earth.

The Prince of Empirics.—And now appeared upon the stage of action an individual—Paracelsus by name—whom the whole medical world denounces as a base, impudent, and unprincipled charlatan, yet to whom the same medical world is more indebted for the present system of allopathic drugging than to all other physicians who have ever lived. It is to him that we owe the introduction of the antimonial and mercurial practice which constitutes the great strength of the popular materia medica, and, I may add, its terribly devastating power on human constitutions.

Aureolus Phillippus Paracelsus Theophrastus Bombast de Hohenheim, as he delighted to style himself, was born at Enseidlen, in Switzerland, in 1493. His father, who was a physician, took great pains in his education, and he became a proficient in physic and surgery; but becoming charmed with the study of alchemy, his father committed him to the instructions of Trithemius, abbot of Spanheim, who was renowned for knowledge in the secrets of alchemic art.

Paracelsus, by bold pretensions, and a few lucky adventures in the field of medical practice, became celebrated among the learned of his day, and was made a medical professor in Basil, in 1527, where he received for a short time a large salary. In the "pride, pomp, and circumstance" of this honored position, he burned, with great solemnity, the works of Galen and Avicenna, declaring to the astonished and probably admiring multitude that, as he had found the philosopher's stone, mankind had no further use for the medical works of others.

It is recorded of Paracelsus that he performed some great cures. It is certain that some of his great cures were the exact prototypes of many great cures performed daily among us at the present time, and not very much to the advantage of the patients. For example, he cured the celebrated printer of Basil, Jerohemus, of a pain in the heel, after "every thing else had been tried in vain." There is, however, a qualification of the story. The treatment moved the pain from the heel to the toes, which became entirely stiffened, and although the patient had no more pain, he soon died of apoplexy!

How far a certain accident had to do with his singularly erratic and profligate life, is worthy of a passing thought. In early childhood he was made a eunuch from an unfortunate mutilation by a sow, and as he grew up he became a perfect hater of womankind, while a love of

mere notoriety seemed to have become the passion by which he was ruled.

His principal doctrine, that the human body is composed of the three elements of salt, sulphur, and mercury, was *stolen* from the writings of Valentine, and his principal remedies in all diseases were mercury antimony, and opium. If the reader fail to discover any relation between such theory and such practice, he is in no worse predicament than he will find himself, in most cases, if he attempt to trace the connection between most of the medical theories and practices in this more enlightened day.

The medical life of Paracelsus may be stated in few words. He surreptitiously appropriated another man's invention as his own, practiced the vilest arts of charlatanry, assumed the most pompous titles, proclaimed that he had discovered a universal panacea, the long-sought *elixir vitæ*, by which life could be prolonged to an indefinite period, lived a dissipated vagabond, and died prematurely at the age of forty-eight.

The Regular and Irregular Controversy.—Although Paracelsus introduced a new era in medical practice, and had, like most other noted characters of lofty-sounding pretensions and brazen-faced impudence, abundance of followers, still many of the "old-school" physicians held out against the innovations of his disciples. Thus originated a contest between the Galenists and Chemists, which was prolonged through the sixteenth century. The Galenists were the regulars, and the Chemists were the empirics, of that period The former dealt out prodigiously multitudinous compounds, and the latter made a bold stand with fewer but much more potent agents, while each sect accused the other of killing their patients, I fear with too much truth. The Paracelsian doctors ultimately triumphed, and, as a singularly striking exemplification of the strange inconsistency between the fancies and facts of misnamed medical science, it may be told that the medical world has long since repudiated every vestige of the arts, pretensions, and doctrines of Paracelsus and his apostles, yet retained, imitated, and greatly extended their practice; for, notwithstanding modern chemists have added several hundreds of other chemical preparations to the materia medica of the great Quicksilver Quack, there is hardly a disease in the catalogue of human ailments in which the employment of mercury, antimony, and opium is not recommended by the standard authors and living teachers of the drug system.

The Anatomical Physician.—While the discussions between

the contending parties just noticed were gradually extending the influence of the empirical practitioners, and circumscribing that of their adversaries, the science of anatomy began to be more accurately cultivated, which circumstance gave rise to a sect of physicians called the Anatomists. Vesalius, about the middle of the sixteenth century, prosecuted this department of knowledge with unwearied assiduity. He was followed by Eustachius and Fallopius, who acquired great reputation for anatomical skill. The anatomical physicians, however, did not introduce any thing original in relation to the theory or the practice of medicine. They were divided concerning the opinions of Galen, and may be subdivided into his defenders and his opposers; between these sub-sects long and acrimonious discussions occurred, not concerning what was true or what was false, but whether the notions of Galen were right or wrong.

Revival of the Hippocratean Doctrine.—During the seventeenth century the doctrines of Hippocrates again became the prevailing medical philosophy. Anatomy made rapid progress; Harvey discovered the circulation of the blood; Asselli, Rudbeck, and Bartholine traced out the absorbent system; and Malpighi, Hooke, and others, explained the structure and functions of the lungs. Boyle disengaged chemistry from the mystery by which it was surrounded, and explained its true province to be, not the manufacture of solid gold, nor liquid nostrums, nor gaseous theories, but "an investigation into the change of properties which bodies experience in their actions upon each other."

Still the chemical physicians kept up the popularity of their practice by mixing with it not a little of the magical ceremonies and astrological pretensions so rife a few centuries before. Some of them acquired extraordinary popularity, and many of them, particularly in England, become apparently sincere fanatics to their own system. Among these were Fludd, who manifested implicit faith in astrology; Kenelm Digby a man of rank and refined education, who published an account of th mystical virtues of the "sympathetic powder;" and Valentine Greatrix, who cured all diseases by the imposition of the hand. "These circumstances," says Bostock, "are interesting, not merely as forming a part of the history of medicine, but as displaying a singular feature in the history of the human mind; demonstrating the difficulty which exists in eradicating from it errors and follies, even the most gross and palpable, when they have once become deeply rooted."

Although the discoveries alluded to in anatomy had turned the attention of medical men more to vital actions, as affording a better explication of the phenomena of disease than chemical changes, and had generally

restored the humoral pathology of Hippocrates, the practice of medicine did not undergo a corresponding change. The Anatomists were anxious of course to have their pharmacopœia include "all the modern improvements," hence they pursued a mixed or compound practice, by adding the mercury, antimony, and opium of Paracelsus, and other drugs of more recent production, to the bleeding, purging, sweating, etc., of the earlier physicians. In fact, they incorporated nearly all that was known of a poisonous or destructive nature among their therapeutical agents, and omitted nearly all that was really worth preserving—attention to diet, regimen, bathing, cleanliness, etc.

The Fermentationists.—Another sect of physicians now arose, or, rather, a branch of the Chemists, who attempted to blend the crude chemistry of the day, and the cruder physiology, into a compound philosophical system. The leading doctrine adopted by this sect was, that certain fermentations in the blood, and other fluids, were the causes of the different states of health and disease; certain humors were acid; others alkaline; and, as one or the other predominated, a corresponding specific disease was the result. Thus fever was an acidulous disease, requiring alkaline remedies, etc. This notion was eloquently advocated by Sylvius, who filled the medical chair at Leyden, and became the fashionable doctrine in France and Germany for a considerable time. Willis, of England, was also an able defender of the chemical doctrines; he published a work in 1759 on fermentation and fever, wherein he attempted to prove that every organ in the body had its own peculiar fermentation, a morbid state of which constituted disease.

Sydenham, who has been called the English Hippocrates, agreed with Willis in the theory of chemical fermentation, but adopted the Hippocratic doctrine, that the primary changes in disease take place in the fluids instead of the solids. He also agreed with Hippocrates that disease was an effort of nature to get rid of noxious matters, and, like his great prototype, adapted his remedial agencies mainly to the regulation of the actions of the system. Though his practice has been called feeble and inert, it would be difficult to name an equally successful physician among the bolder practitioners who have wielded more potent drugs since his day.

Notwithstanding numerous discoveries had been made, and many facts accumulated up to this date in chemistry, anatomy, and physiology, it is at least questionable whether any more rational views were entertained of the true nature of disease than were advanced by Hippocrates nearly three thousand years before; and it is positively certain

but none among the most eminent of the new schools or sects of more modern date, have been more successful in curing diseases than were Hippocrates, Galen, and Sydenham.

The Mathematical Physicians.—Mathematical science having made considerable progress during the latter part of the sixteenth century, the medical theorizers of the day seized upon its facts to effect another doctrinal revolution; hence arose a sect whose members composed the Mathematical school. Borelli, a profound mathematician, undertook to explain certain functions of the body on mechanical principles; and his pupil, Bellini, maintained that all the actions of the body were under the influence of gravity and impulse, and that all the vital functions could be elucidated by an application of the principles of hydraulics and hydrostatics. The new hypothesis soon ranked among its converts many of the most learned men of the age, and the Mathematical physicians became formidable rivals to the Chemical. The phenomena of disease were accounted for by, or, rather, referred to, the mechanical terms of *derivation*, *lentor*, *obstruction*, *friction*, *resolution*, etc.; but, as has been the case in most instances from the creation of the world to A.D. 1851, the practice had little or no relation to the theory. Diseases were treated by the Mathematical physicians with the remedies of the Chemists and Galenists. Indeed, the practical part of medicine was regarded then, as it had been long before and has been long since, of secondary importance to the theory. The minds of medical men were mainly devoted to theoretical speculations, and vastly more talent was wasted in endeavoring to establish and promulgate favorite dogmas, of no earthly use, except to render the authors of them famous, than was expended in investigating truth or curing diseases.

The Vitalists.—The next medical sect in order was the Vitalists. It originated with Van Helmont, and finally triumphed over both the Chemical and Mathematical sects. Van Helmont at first belonged to the Chemical school; but to its doctrines he added the idea of a specific agent residing in, or attached to, the system, which controls its own spontaneous actions, and also the actions of remedial agents. This conception was doubtless the ideal germ of the vital principle of later physiologists, and the *vis medicatrix naturæ* of the present day; nor is it radically different from the idea of the efforts of nature as entertained by Hippocrates.

Van Helmont proposed nothing new in the way of curing diseases, contenting himself with mere matters of opinion; and the communi-

cation of his doctrines did not allay the wordy warfare still waged between the Chemists and Mathematicians, until it was revived and refined by the genius and energy of the next successful adventurer in the field of medical theory.

This was Stahl, who was born at Anspach, in 1660. He undoubtedly saw the sad deficiencies and gross errors in the prevailing theories and, perceiving that neither chemical nor mechanical reasoning, nor both, could ever explain the phenomena of life, he referred vital actions to the operation of a principle he called *anima*. From a close observation of the influence which the mind exercises over the body, he came to the conclusion that all the vital functions were produced and sustained by the influence of an animating and superintending spiritual principle. This principle prevents or repairs injuries, counteracts or removes morbific causes, and, in fact, appears to be the aggregate of what modern physiologists speak of as the *organic instincts*

But, as an exception to the general rule, the theory of Stahl did influence his practice very considerably, for, instead of the rash and dangerous potencies and processes then in vogue, his views, in the language of an eloquent historian, "tended to repress the energy of the practitioner still more than the pathological doctrines of Hippocrates. They did, indeed, cause him to trust more to his presiding deity—the great physician, Nature—and less to artificial drugs and destructives. Happy would it have been for the human race if a more inert practice had continued to this day, to "repress the energy of the practitioner," for sad experience, and the constantly accumulating catalogue of human ills and chronic maladies, unheard of in former days, sufficiently demonstrate that success in curing disease holds a much nearer relation to the inertness than to the energy of the practitioner, as far as active poisons are concerned.

The doctrines of Stahl, and the extraordinary metaphysical acuteness with which they were supported, had an extensive influence on medical opinions; but about that period there were so many rival medical schools evolving new theories, each advancing their claims to notice with great zeal and ability, that it was impossible for any one hypothesis to be generally received.

The Solidists.—Hoffman, the contemporary of Stahl, was also his colleague in the University of Halle, as well as his rival, and an equal aspirant for name and fame. He wrote voluminously, and the principal theoretical notion which he originated was a modification of the Stahlian doctrine of vitality. Instead of referring the operations of the animal economy to an anima, he imputed them to a *nervous influence*

This was almost a distinction without a difference, but it served his purpose. The details of his practice were essentially those of the Chemical and Mathematical physicians, possessing no new feature whatever. His pathology united the notions of the Humoralists and Solidists, and he advanced the doctrine of *tone and atony*, or *spasm and relaxation* of the moving fibres—a doctrine which long influenced the writings of his successors, and which was, no doubt, derived from the ancient notion of constriction and relaxation. His writings are said to abound in inconsistencies and contradictions.

In 1671 Glisson published a treatise, in which he advocated the doctrine of muscular irritability, explaining it as a specific property attached to the living fibre, in opposition to the humoral pathology of Hippocrates, which until this time had generally prevailed. Toward the close of the seventeenth century, Bagliva, an eminent medical scholar, systematically opposed the Hippocratic pathology, placing all the causes of disease in an altered condition of the solids. These two writers laid the foundation for the overthrow of the humoral pathology and the introduction of solidism, which has been very generally received by the medical profession to the present time. It is now, however, decidedly on the decline.

But this revolution in theory had no perceptible effect on the practice. Whichever hypothesis the physician adopted was the same to the patient. The prescriptions were alike in either event.

The Metaphysical Physicians.—Soon after the revival of letters, the greatest scholars among medical men were incessantly laboring to apply the inductive philosophy introduced by Bacon, and found so successful in advancing other departments of philosophy, to the study of medicine as a science. How signally they failed, let the record of innumerable theories which have come and gone, like the changes of the moon, testify. This failure was not owing to a want of learning, or ambition, or industry, or integrity of purpose. It is attributable purely to the want of the true starting-point. The learned world was full of book-made philosophies, brain-racked theories, and closet-engendered metaphysics. The minds of medical authors were all more or less warped and beclouded with the speculations of their predecessors and teachers. There was no one of sufficient originality of intellect and independence of mind to cast off the tremendous incubus of venerated authority, and go directly to the truth itself for the evidence of truth—to ask nature to interpret her own laws. Destitute of all demonstrable premises upon which to predicate their investigations, and from which to extend their inquiries, each one seems to have conceived a hypo

thesis, or detected an error, and then studied and wrote to maintain the one or refute the other. The direction of men's minds was too mystically metaphysical for the prosecution of true philosophical research. How few men have ever lived who had mental capacity even to think of a first principle!

Boerhaave.—No one ranks higher in the annals of modern medical history than Boerhaave, who was contemporaneous with Stahl and Hoffman. He was a professor at Leyden, and in practical judgment has been justly regarded as superior even to Galen. But in groping among the dark chimeras of his predecessors he was unable to find any thing more enduring than mere conjecture and gratuitous assumption upon which to establish a new system. He attempted, however, to form and fashion out of the discordant materials before him a theory and practice which should combine the excellences of all systems, and be truly eclectic. But any system, embodying such conflicting opinions as were found in the speculations of the different schools, must necessarily contain the seeds of early dissolution; and accordingly we find that the system of Boerhaave did not long survive him. His nephew, Kauw Boerhaave, his successor, Gaubius, and Gorter, a professor of Harderwyc, wrote extensively on medical subjects, but to little account, save to restore the vital agency in explaining the phenomena of disease, which Boerhaave had nearly discarded.

Van Swieten, professor in the medical school at Vienna, was a follower of Boerhaave, and the ablest supporter of his views. He wrote extensive commentaries on the multitudinous aphorisms of his predecessor, but they were of little practical value.

Haller.—This distinguished scholar, who has been called the father of modern physiology, was a pupil of Boerhaave. He possessed a mind singularly original and comprehensive, and after long and patient research into the nature of the functional powers of the human body, made a substantial improvement in physiological science. Disregarding all the authority of learned names and mere theories, he established the doctrine of the irritability and sensibility of the muscular and nervous systems. His Elements of Physiology "introduced a new era into medical science." His peculiar views were warmly controverted by many distinguished writers, and as warmly supported by others.

The Semi-Animists.—While Haller's doctrines were strengthened and confirmed by numerous experiments instituted by Zimmerman, Caldani, Fontana, Tissot, Zinn, and Verschuir, they were powerfully

opposed by Whytt and Porterfield, of Scotland, whose reasonings, however, though able and acrimonious, have been characterized as much more metaphysical than physiological. Whytt succeeded in founding a sect called the Semi-Animists, whose principal distinctive tenet was a vital or sentient principle compounded of the doctrines of Stahl and Haller, evidently intended as a middle theory between the two.

Sauvages, professor at Montpelier in 1734, was one of the main supporters of the Semi-Animist sect. He was the first to arrange diseases into classes, orders, genera, and species, constituting a methodical nosology. Still we have no evidence that these controversies, modifications, revolutions, or improvements materially affected the prevailing method of treating diseases at the bedside.

CULLEN.—William Cullen, who was the successor of Whytt in the University of Edinburgh, achieved as brilliant a reputation as Haller, and effected as great a revolution in medical practice as Haller did in physiology. In discriminating the phenomena of disease, Cullen was unrivaled; and he was the first medical innovator for ages whose theory and practice were consistent with and strictly related to each other. His "First Lines of the Practice of Physic" were in fact text-books in our medical schools less than a quarter of a century ago. His works on nosology and materia medica have never been excelled in rigid powers of analysis and accuracy of observation, and his opinions are often quoted as high authority by medical journals of the present day. But his carefully elaborated theories were wanting in the one thing needful for an enduring system—an ascertained first principle, and hence were destined to pass away like the baseless fabrics of a thousand other theoretical visions which preceded and succeeded him. No one now pretends to acknowledge or defend his theories, though many physicians, perhaps a majority, follow essentially his practice, thus exhibiting another of those glaring absurdities which stamp with inconsistency almost every page of medical history.

The Cullenian system of treating diseases may be resolved into a single indication, that of counteracting the symptoms. Thus in a fever he would reduce by bleeding, nitre, and other antiphlogistics, in the hot stage; stimulate with bark, wine, tonics, etc., in the cold stage; and obviate spasm, putrescency, etc., with narcotics, alkalies, acids, etc., in the intermediate or sweating stage. Nothing can be more absurd than such a practice in a fever which passes through all these stages once a day, or every other day for several weeks, for it keeps one hand continually working against the other It amounts to nothing but treating

temporary and ever-changing symptoms on a plan of antipathy or antagonism, without any regard to the permanent state of the constitution, or natural course and termination of the disease. Yet, as already intimated, it is the prevailing allopathic practice.

It should be mentioned that Cullen recognized the self-preserving and self-regulating principle of vitality; but he improved on the notions of Stahl, Van Helmont, and Hoffman, in explaining it as an inherent property of organization, which he called the *vis medicatrix naturæ*, or remedial power of nature, rather than a superadded sentient principle.

The Brunonian System.—The Cullenian school found a rival in the bold vagaries of what has been called the Brunonian theory, in an early period of its existence. A Dr. Brown, of Edinburgh, who had been a personal and professional friend of Cullen, became, from some cause—probably spleen, jealousy, or disappointment—his bitter antagonist, and a vehement opposer of his doctrines. To effect his purposes of ambition and opposition he advanced a new medical doctrine. He did not trouble himself about authorities, facts, experiences, or reasons, but simply assumed his principles, announced his doctrines, laid down his practice, supported the whole with lofty pretensions, and found many followers among men of learning and science, and in many medical schools whose professors adopted his doctrines.

Brown maintained that life was a forced state, analogous to the flame of a candle; that any thing which affects the living body acts as an excitant or stimulant upon a specific property it possesses, which he termed excitability. Thus defective excitement or stimulation produces accumulation of excitability, or indirect debility, while excessive stimulus produces exhausted excitability, or direct debility; and that all diseases are referable to one or the other of these states, requiring stimulating or reducing measures, as the excitability is exhausted or accumulated. The practice that naturally results from such a theory or phantasy is bleeding in one class of diseases, and brandy in the other; and, in truth, the world is much indebted to the genius or the impudence of John Brown for the extensive use of alcohol and alcoholic mixtures in modern medical prescriptions.

The poetical and refined Darwin deserves a passing notice here, as a fruitless theorist and elaborate speculator. His "Zoonomia" is certainly a monument of genius, but destitute of any sound philosophical principles, and his medical notions are now universally regarded as purely fanciful.

Medicine at the End of the Eighteenth Century.—At the

conclusion of the eighteenth century, the physicians on the continent of Europe generally pursued the eclectic plan of Boerhaave. Among the French, Lieutaud, who published in 1749 a great work called "Synopsis Universæ Praxeos Medicæ," was the most celebrated. In Germany, De Haen published a work equal to Lieutaud's, called "Ratio Medendi," but he bitterly opposed all the new notions of that period, and warred against Haller's doctrines, and against the practice of inoculation. The most celebrated medical schools in Europe were those of Paris, Vienna, and Leyden. The medical schools of Italy also enjoyed a high reputation. Bonet and Mangel there introduced the study of pathological anatomy, which was followed up by Valsalva and Morgagni, who made extensive post-mortem examinations, and recorded the anatomical appearances of the structures. One source of error, however, pervaded all their observations, as it does post-mortem investigations at this day. It is this. Structural appearances after death denote the *effects* of disease; and these morbid changes were and are often mistaken for or confounded with the *causes* of disease.

Burserius was the only theorist of any note that Italy produced at this time, but his works are only admired for the elegance of the language in which they are written. The Italians adopted the Brunonian system; but the fatality attending its practical application caused its utter abandonment, and a return to the equally irrational theory but somewhat less fatal practice of the Cullenian school. The Egyptian physicians were more disposed to prosecute anatomical and physiological researches than to form systems of any kind.

With the progress of chemistry during the eighteenth century, many of the feebler articles and more complicated compounds of the pharmacopœias were substituted by more simple yet more powerful metallic and mineral preparations and vegetable extracts—powerful in the sense of the strength or force of the impression, not in reference to the quality, or kind, or utility of that impression; and if this was an improvement in pharmacy, as medical historians usually inform us, there was assuredly some progress made in the *dealing*, if not the healing art. It was an improvement by which apothecaries have profited to the extent of many millions of dollars.

Medicine in the Present Century.—The historian who carefully and without prejudice surveys the present state of the medical profession will observe one of the strangest anomalies which the human mind can contemplate. He will observe a learned profession, adorned with as bright a galaxy of names—scholars, philosophers, and philanthropists—as any profession in any age of the world could ever boast.

devoting themselves, with a zeal and industry worthy of all praise, to the study and practice of medicine, yet having no confidence at all in their own system, and, stranger still, wondering and complaining that the great masses of the people have no confidence in it!

Bostock has admitted that "our actual information does not increase, in any degree, in proportion to our experience." The solution of this remarkable problem will be found as we proceed.

Never was any department of human knowledge prosecuted with greater assiduity and energy than have been all the sciences collateral to the practice of physic, during the last fifty years. Anatomy, chemistry, and operative surgery have, indeed, made wonderful and substantial progress. Pathology has been greatly advanced. Physiology has been diligently studied, but unfortunately with little success. True, facts in physiology have multiplied exceedingly, and hypotheses into which they have been woven have added greatly to the numerical strength of medical libraries; but as far as demonstrating the laws of life, or increasing our means for the cure of disease, I may safely assert what Bostock admits, viz., "So far as the practice of medicine is concerned, the benefit is rather in anticipation than in existence."

In anatomy, surgery, and materia medica, Great Britain and America have produced many illustrious names, among whom may be mentioned Hunter, Munro, Bell, Cooper, and Pereira, of the old, and Wistar, Horner, Physick, Mott, Eberle, and Dunglison, of the new, world. In physiology, analytical chemistry, and anatomy the Germans have taken the lead; and pre-eminent among those who have acquired distinction are Camper, Blumenbach, Soëmmering, Meckel, Tiedeman, Sprengel, Rosenmüller, Müller, and Liebig. In pathology and pharmacy the French have outstripped all other nations, and the labors of Pinel, Andral, Breschet, Broussais, Corvisart, Cruveilhier, Dupuytren, and Laennec have obtained a world-wide celebrity; while in physiology the French school has given us the works of Bichat, Cuvier, Richerand, Majendie, and others. Italy is far behind the other countries named, yet it has produced a few eminent medical scholars, among whom are Scarpa, Mascagni, Ronaldo, and Tommasini.

But while this tribute is due to the talents and acquirements of the medical philosophers of this age, it must be remembered that all their vast array of learning, and all their multitudinous writings, have done nothing toward placing the healing art on a true philosophical foundation. They have rather tended to render the confusion of ancient dogmas worse confounded by modern speculations.

If a gangrenous limb is to be amputated, a tumor removed, a cancer

excised, or a toe disjointed, Professors Mott, Parker, Dudley, Rogers, Detmold, etc, etc., can perform the operation with all the skill and judgment the case admits of. Operative surgery has well nigh reached perfection. If it is desirable to know in what proportion of cases in choleras, typhoid fevers, dysenteries, etc., there was nausea, or vomiting, or headache, or pain in the back, or chills, or rigors, or pain in the limbs, among the premonitory symptoms, or what precise shades of color and consistence the various structures manifested after death, we have in the present state of pathological science nearly all the information we shall ever know what to do with. If we would inquire what particular phenomena of symptoms follow the administration of any given mineral preparation or vegetable drug, the materia medicas of the day, though extremely contradictory with each other, give us all the details that can possibly be of any service. And if we would understand exactly what proportion of ultimate or proximate elements enter into the composition of any solid or fluid, of matter organic or inorganic, animate or inanimate, the present state of chemical science gives us as accurate a knowledge as can be of any advantage, so far as the practice of medicine is concerned.

The reader may now naturally ask, Why has not success in treating diseases kept pace with the extraordinary progress of knowledge in the collateral medical sciences? The answer is ready. A philosophical, and hence successful, practice of the healing art must be based upon the laws of life, the economy of vitality. The only foundation, therefore, of a true medical practice is correct physiological principles; and here is precisely where the whole orthodox medical system of the present day fails—utterly and totally fails. It has no physiological science upon which to practice truly the healing art. In the language of one of the greatest of modern physiologists, Majendie, "there is scarcely a sound physiological principle extant."

When I intimate that there is no physiology in the world, I mean, of course, the medical world. Out of the regular profession this science has been more prospered. Untrammeled by the theories of the schools, individuals, not of the order of medical men, have, as I shall hereafter show, demonstrated the true science of life, and laid the true foundation for a medical practice, whose most powerful remedies, so far from being the most potent poisons known on the surface or dug from the bowels of the earth, are the very agencies by which the whole vegetable and animal creations are developed and sustained.

MEDICINE IN THE UNITED STATES.—In no part of the world are medical schools more numerous, medica writers more prolific, and

medical periodicals more abundant, than in the United States. And no age of the world presents a medley of medical scribblers in the regular profession more biased and bigoted in their notions, more visionary in their speculations, more puerile in their theories, and more inconsistent in their practices, than is furnished by the history of the present state of the medical profession in this country. This is not because medical men in this country are not as talented as those of any other country, nor because medical men, as a class, are not as intelligent, honest, and philanthropic as men of any other class. It is simply because there is *no medical science in existence.* The practice of the popular system is purely empirical. From establishing new systems and building new theories, the attention of medical men now seems mainly directed to the discovery of new remedies and the concentration of old ones. The critic who will take pains to examine the standard works of the most popular authors on theory and practice—Good, Watson, Wood, Thacher, Eberle, Elliotson, Dunglison, Dickson, and others—will find, on almost every page, the most contradictory theories supported by equal authority, and the most opposite practices recommended on equal testimony. Well might the celebrated Dr. Rush, of Philadelphia, after a life-long experience in witnessing the effects of drugs upon the human constitution, declare to his medical brethren, "We have done little more than to multiply diseases and increase their fatality."

The diligent student of medical history cannot fail to discover that the ancient and more ignorant practitioners were more successful in curing diseases than are the modern and wiser physicians. The remedial agents of the ancients were comparatively inert and comparatively harmless, and, while they inspired their patients with a due degree of confidence and hope, by the charms and ceremonials of magic and mystery, they really relied on judicious hygienic regulations to "aid and assist nature" in effecting the cure. Modern intelligence repudiates the arts and incantations of a less civilized age; and in their stead has substituted the stronger potencies of modern invention, while the habits of living and thinking, with medical as well as with other men, have become so unnatural and artificial that, in managing diseases, voluntary habits and hygienic agencies are almost wholly overlooked.

The general plan pursued at the bedside of the patient, by regular physicians of this country, and, I believe, of all countries, is intended to be eclectic. While they disown all the theories that have ruled the world by turns, they endeavor to preserve and incorporate in their prescriptions al the remedial means which these rejected theories have

brought into favor. The only point of skill is to discriminate the exact disease, state, stage, condition, temperament, age, or other circumstance, which renders this, that, or the other, or all together, the most advisable in the experimental prescription. The only acknowledged guide now is experience. But unfortunately the guide points all ways at the same time. There is no common agreement in the testimony of medical men respecting the indications of the most common diseases, nor the properties or operative effects of the most common articles of the materia medica.

To illustrate: Bleeding has been extensively employed in typhus fevers for three hundred years, yet physicians are divided in opinion whether it is good or bad practice. Opium has been in use over two thousand years; but medical men cannot agree whether it operates primarily as a sedative and secondarily as a stimulant, or exactly the contrary, primarily as a stimulant and secondarily as a sedative. Mercury has been employed more or less for about three hundred years, and extensively during the last fifty years; and some authors consider it a tonic, others a stimulant, others a deobstruent, or alterative, others a sedative, and yet others an antiphlogistic. Brandy has been freely administered in the city of New York and elsewhere in the treatment of the cholera during two epidemics; the result of the experience is, about half of the physicians commend it highly, and the other half condemn it utterly. Within the last fifty years no less than four different methods of treating ordinary fevers have prevailed: the bark and wine practice, the cold affusion practice, the bleeding and saline practice, and the mercurial and opium practice. In about the same period. some scores of specifics for some of the most formidable diseases have been discovered, tried, proved, and then laid aside, to be followed by others which experienced a similar rise and fall of reputation. Digitalis, the effluvia of cow-stables, and a preparation of nitric acid and opium, have been among the vaunted cures for consumption. Twenty years ago iodine was found to be a specific for scrofula; but no one now thinks of it save as an occasional auxiliary; and two years ago cod-liver oil was literally flooding the country under the auspices of the allopathic medical journals, and the right wing of the great medical army, the apothecaries, as a remedy for consumption and scrofula; but its brief day is already drawing to a close.

These facts are enough to show the utter fallacy of medical experience, and the unsatisfactory nature of medical testimony, unless based upon some intelligible principle to which we can refer the phenomena they present. I cannot more appropriately conclude these remarks than by the following extract from Bostock's history: "In modern times

and more remarkably in Great Britain, no one thinks of proposing a new mode of practice without supporting it by the results of practical experience. The disease exists, the remedy is prescribed, and the disease is removed; we have no reason to doubt the veracity or the ability of the narrator; his favorable report induces his contemporaries to pursue the same means of cure; the same favorable result is obtained and it appears impossible for any fact to be supported by more decisive testimony. Yet in the space of a few short years the boasted remedy has lost its virtue; the disease no longer yields to its power, while its place is supplied by some new remedy, which, like its predecessor, runs through the same career of expectation, success, and disappointment."

HISTORY OF BATHING.

A complete record of the bathing customs of all nations, and of the remedial uses to which water has been applied by medical men, would furnish us with many more examples of what has been done amiss, than of what is worthy of imitation. Somehow or other at some time or other, the idea came to possess the minds of practitioners of the healing art, and through them the minds of the people generally, that impure waters were more healthful for sick persons than pure. Consistently with this ridiculously absurd vagary, those springs of water which contain the greatest amount and variety of impurities, are the most celebrated as resorts for health-seeking invalids. And this silly conceit regarding the remedial influence of drugged waters has extended to their external as well as internal employment; hence all manner of artificially medicated, mineralized, saline, alkaline, acid, oleaginous, spirituous, gasified, and compound baths and fumigations have found advocates in the ranks of the medical profession. It seems to be inconceivable to the book-biased minds of most regular physicians that *pure* water can dissolve and wash away the *impurities* of the body better than *impure* water. In their view some foreign agent, something extraneous, something powerful must be taken or applied to destroy the morbid entity, or counter-irritate the diseased condition, or "force a healthy action." When it is considered that the solvent property of water is exactly proportioned to its freedom from all extraneous ingredients held in solution, the strange hallucination that prefers sulphur, iodine, iron, saline, and other unclean springs, to the pure element as it distils from the clouds of heaven, for medical purposes, will have to be put down to the account of those things on this earth which are wholly unaccountable.

ANCIENT BATHING.—Almost as far back as we can trace historica

data, we find accounts of various domestic baths. The earliest Bible account of bathing speaks of the daughter of Pharaoh and her attendants going down to the Nile. Homer speaks of the bathing habits of many of his heroes. Hercules was indebted to Minerva and Vulcan for the refreshing influence of warm baths. Althenæus informs us that it was the custom of antiquity for women and virgins to assist strangers in their ablutions. Among Oriental nations the means for bathing were provided as an act of hospitality for travelers.

Both the Old and New Testaments frequently mention bathing as a sanatary and healing process, and as a religious rite. With all the ancient nations frequent ablutions or immersions were typical of moral purity. Moses, Jacob, Aaron, Job, as well as the more ancient patriarchs, enjoined and practiced bathing as a means of both bodily and spiritual purification. Jews, Christians, Mahometans, and Pagans have all agreed in one tenet, the baptism of personal cleanliness. Elisha the prophet directed Namaan the leper to bathe seven times in the Jordan. Our Saviour commanded the blind man to wash in the pool of Siloam. Many of the sick were sent to the healing waters of Bethesda. The Greek and Egyptian priests washed themselves in cold water several times a day.

Bathing in the Middle Ages.—But in process of time, as the customs of societies and nations became more complicated and sensual, bathing degenerated almost into a means of mere luxury and sensuous indulgence. Though the Egyptians first reduced bathing to a systematized part of the medical practice of their day, and for ordinary purposes recommended cold ablutions in preference to warm baths, as the habits of the people became luxurious and enervating, the cold ablution for health was substituted by the warm immersion for pleasure.

The Greeks adopted the bathing customs of the Egyptians, and attached public baths to their gymnasia; and a bathing room for guests was a common apartment in their private houses. Socrates, Aristotle, and Plato speak of baths as in common use. Hippocrates, the "father of medicine," recommended them for many hygienic and therapeutic purposes.

The Spartans were in the habit of plunging their new-born infants into cold springs. The members of their adult population were certainly fair specimens of vigorous health and powerful frames. But medical theorizers have explained this fact in another way. They assert that the practice *killed* all the tender children, the robust only being able to survive it; so that all who lived through it and grew up to manhood were robust and healthy *in spite* of the bathing. But the

assertion is wholly gratuitous, and, notwithstanding it is the prevailing opinion of the medical faculty, there is not a particle of evidence to sustain it. I have seen too many children in New York city who have been bathed in cold water from birth, every one without exception becoming remarkably robust and healthy compared with non-bathed or warm-water-washed ones, to give the least credence to a statement which seems to have been made on mere theory, without any investigation at all.

The ancient Germans were much addicted to cold bathing. The Gauls, the powerful progenitors of the British race, had *sacred fountains*, which were resorted to for the purpose of bathing and healing diseases; and in England many cold springs have been celebrated for their curative virtues.

In the days of Roman pride and luxuriance public and private baths were constructed on a magnificent scale; and the agriculturists, soldiers, and laborers would frequently bathe in the Tiber. After the aqueducts were built, by which an abundant supply of water was introduced to Rome, warm baths became general; and, instead of being employed for cleanliness and health, they were soon regarded as a mere source of luxury, and thus became a means of physiological degeneration and effeminacy. Public buildings, called thermæ, for warm bathing, increased rapidly, and in the days of Nero, who erected a most sumptuous one, they numbered eight hundred or more. With the baths were connected grounds for sporting and athletic exercises, and extensive libraries. The baths of Caracalla had sixteen hundred marble seats, capable of seating three thousand persons, and were ornamented with two hundred pillars. But surpassing all others in size and splendor were those of Diocletian. It is related that in their construction he employed forty thousand Christian soldiers, whom he caused to be massacred as soon as the work was completed. Such are the consequences of perverting the practice of bathing for the sake of that "cleanliness which is next to godliness," and that health of body which contributes so powerfully to a sound mind, to a mere lustful enjoyment. The warm bath degenerated into the hot, and feasting and gluttony became parts of the purpose for which a Roman bathing establishment was frequented.

The Greeks, too, constructed immense bathing establishments, and furnished them with all the appliances of health and luxury, as cold, warm, hot, and vapor baths; but unfortunately, as in most cases where good and evil are placed before the judgment and sensuality of human nature, the latter proved victorious. Lounging in warm water, and anointing the body with an immense profusion of oils, soaps, and per-

fumes, became favorite amusements, followed, of course, by indolence and enervation.

When Alexandria was conquered by the Moslems it contained four thousand baths, constructed on the Roman plan; and when the Spaniards conquered Granada the bathing habits of the Moors, and also their language and dress, were prohibited, as a means of their conversion.

In most of the large European towns, in the "barbarous ages," public baths were erected, where the people bathed each Saturday evening. The early Christians of Gaul had baths constructed in their convents. Pope Adrian I. recommended the parochial clergy to visit the baths, in grand procession, every Thursday. The institutions of chivalry required the knight to be subjected to a complete ablution before receiving his armor. The Order of the Bath, still retained in England, originated from the circumstance that the candidate was knighted while immersed to the chin in a highly decorated bath.

Bathing Habits of Different Nations.—The people of Switzerland are said by Marcand to bathe more generally than those of any other country. The baths at Baden have been as celebrated for their abuses as for their uses, having been resorted to during the sitting of the Council of Constance, more for luxury and debauchery than for health. Such is not the case, however, at present.

In Italy the numerous warm and mineral springs are much resorted to, especially in the northern part, where immersion and douche bathing are common. To most of their celebrated springs the poor are allowed free access; and attached to some of them are hospitals for invalid soldiers.

The Germans have long been accustomed to warm bathing. Charlemagne had a bath constructed, capable of accommodating one hundred persons at a time, and it was his custom to sit in council in a large warm bath of the waters of Aix. During the prevalence of leprosy, in the middle ages, bathing was enjoined as a religious duty; and as diseased persons commenced frequenting the public watering-places, the people generally resorted more to the rivers. At present bathing at the regular establishments is quite systematized, yet the people are more generally negligent in regard to the practice than formerly.

In Russia vapor baths have long been and are still celebrated. In their establishments the vapor is obtained by pouring water on heated stones, and the temperature is raised to 122°, and even 133°. The vapor bath is followed by tepid, and then cold ablutions, and sometimes a lake or river plunge or a rolling-in-the-snow bath. Rubbing the

body and lathering it with soap are usually parts of the Russian process.

The Finlanders resort often to the dry and moist sweating baths, the vapor for the dry being 122°, and for the moist 140° to 167°. The latter process is painfully suffocative and extremely debilitating. Most of the peasantry have bath-houses, used by men and women promiscuously. They are constantly in the habit of passing from the atmosphere of their bathing-rooms, which are heated to 167°, to the open air out-doors, where the thermometer is down to 24° below zero, transitions, which, astonishing as they appear, do not seem to produce any immediate inconvenience.

Throughout Sweden, Norway, and Lapland baths are very common.

The Oriental nations have the most numerous and splendid bathing establishments of the present day.

The public baths of Turkey are spacious edifices of hewn stone. The temperature of the rooms is about 100°, where the bather soon gets into a perspiration by the heated air, and is rubbed, kneaded, stretched, lathered, and perfumed, and finally washed with tepid or cold water to his liking. Smoking and coffee succeed the operation. The long-continued warm and hot bathing gives to their females a peculiarly pale, peach-like softness of skin, indicative of lassitude and debility rather than health and strength. In fact, luxury, mere animal gratification, seems to be the only purpose thought of in most of the bathing establishments of the East.

The Persians rival the Turks in magnificence, if not in convenience. But the manner of bathing differs materially from the Turkish. The toilet is the leading idea of a Persian bath. Instead of rubbing, shampooing, etc., the attendant, or operator, is mainly occupied in staining the beard and hair black, the feet and hands yellow, and the nails of the fingers and toes of a deep red.

In Egypt and India bathing is practiced in a manner very similar to that of the Turks. In Cairo there are about seventy public baths. In addition to the manipulations of a Turkish bath, the attendant of the Egyptian bather rubs the soles of the feet with a kind of rasp, made of baked clay. It is customary for betrothed females to go in grand procession to the bath a day or two before marriage, accompanied by intimate friends and relatives. The three stages of the bathing process consist of sweating, rubbing, and washing. Aromatic unctions are generally employed, and the Persian fashion of dyeing the nails with a preparation of henna is very much in vogue.

The East India baths are conducted similarly to those of the Egyp-

tian. The women of quality spend much time in them, and seem to realize in their use only a source of sensuous pleasure.

The Mahometans are required to bathe three times a day. Among them a depilatory pomatum, to remove the hair, is often applied; it is composed of sulphuret of arsenic and quick-lime mixed with fat.

The Bramins are under the same religious injunction to bathe as the Mahometans.

The Hindoos of all classes perform their devotional pilgrimages to the Ganges and the Jumna, to bathe in their sin-absolving waters.

Among the North American Indians bathing, especially in rivers, has always been a general practice. Some tribes in the vicinity of the Rocky Mountains use the sudatory or hot sweating bath, followed by the cold plunge. Some of the extreme northern tribes make a square mud box on the edge of the river, in which they sit and enjoy a vapor bath, with steam raised by means of hot stones and jugs of water. This is rather a fashionable recreation among them, and is often practiced in parties for social amusement. On the frontiers a bath is constructed of wicker-work, the tip of which is covered with skins. William Penn saw an Indian chief, in the "colony of Pennsylvania," entirely cured of an attack of fever, by a thorough steaming, followed by several plunges in the river, for which purpose a hole was cut through the ice.

The Peruvians have numerous public baths, both from hot springs and from their hundreds of miles of aqueducts.

The Abysinians are represented by the traveler, Bruce, as in the habit of treating the violent fevers of that country with cold water externally and internally.

The Mexicans originally bathed in a sort of oven, into which the bather crept when sufficiently heated, and, by pouring water on the hot stones, raised a vapor and produced copious sweating. Kentish affirms that this bath is resorted to as a remedy for stings of insects and bites of poisonous reptiles; it is employed also by women after childbirth.

The French were long ago generally accustomed to bathing. Vapor and other baths were numerous in Paris at an early period of its history. Lately the vapor baths, which are frequent along the banks of the Seine, are employed as preparations for the warm-water bath. That they are visited, however, more for entertainment than from any sense of hygienic virtue is evident from the fact, that they have been occasionally closed for a time by the public authorities, and were once prohibited during the prevalence of a contagious disease. In Paris there are at present many warm, cold, and vapor bathing establish

ments, some of which are very properly connected with the hospitals. Cold baths and swimming schools, for each sex separately, abound on the banks of the Seine.

In England bathing institutions arose and declined with those of Rome. Soon after the conquest of England by the Normans the leprosy made its appearance, when bathing habits revived again, and in treating the disease the cold bath was generally resorted to. About the middle of the sixteenth century the bathing practices of the people again degenerated to mere luxury; and, up to the present time, its warm, hot, mineral, and sulphurous springs have been quite a fashionable resort for that class of fashionable invalids whose complaints are closely connected with fashionable indolence. Now, however, cold bathing is increasing in favor, and promises to become general. Dr. Bell thinks it has already been carried to an extreme for medical purposes!

The people of the United States have never yet been overmuch given to bathing in any manner. The more wealthy in our cities resort to the bathing-houses occasionally, and in the warm season many of the city and country people amuse themselves by swimming in our rivers, lakes, ponds, and at various places on the sea shore. Some persons content themselves with washing the whole body once a week; others once a year; and a few are satisfied without washing at all. Every well-wisher of the human race will hope they will remain as they are in this respect, rather than imitate the sensualizing bathing customs of the old world. But attention to the general subject of bathing is fast awakening among us, and there is every reason to believe the great masses will ere long become sufficiently intelligent to adopt daily bathing as a physiological, hygienic, moral, social, and eminently Christian duty and privilege. Our largest cities, New York, Philadelphia, and Boston, have within a few years supplied themselves with an abundant supply of good soft water; many other cities and villages are about following the example, and the people in our country places are fast turning their attention to the benefits of having pure water for both bathing and drinking purposes. Bath-rooms, in the cities above named, are beginning to be regarded as indispensable apartments of public buildings and private dwellings. The numerous hydropathic establishments springing up in all parts of the country are perhaps the most efficient instrumentalities in indoctrinating individuals and families into the theory of personal cleanliness; and with all the agencies named we may regard the prospect for this nation to become "redeemed, regenerated, disenthralled," from obstructed pores and foul secretions, as very promising.

MEDICATED BATHS.—A brief notice in this place of the various methods of *impure* bathing, invented by superstitious ignoramuses and learned Æsculapians, may serve a better purpose than mere amusement for the reader.

A medicated bath, in the popular medical sense, is water or hot air charged with some drug or extraneous ingredient. In ancient times medicinal baths of oil, oil and water, milk, milk and wine, and even of blood, were employed. More recently, baths made of the steepings of the husks and other refuse matters of grapes, and of olives, after the expression of their juice and oil, have been employed; and still later gelatine, dissolved in water, has been recommended by physicians, probably as a *nutritious* bath!

Mud baths or *earth baths* have been employed in Germany, France, Italy, and other places. The process of a mud bath is technically called *illutation*. A kind of artificial illutament—presuming mud to be the *natural* one—for anointing the body, was made of oil and the perspirable matter scraped off the skins of the Greek athletæ. Doubtless it possessed as much virtue as any of the "all-healing ointments" of the present day.

Warm dung baths are not unknown among medical prescriptions on the continent of Europe.

Bees-eggs baths, made of wax, honey, and the excrement of bees, have been among the acknowledged outward medicaments, and probably have worked their due proportion of wonderful cures.

The *Sand bath*, called *arenation*, is known to many Eastern civilized and semi-civilized nations. The body is covered up with the warm sand and exuvial matters on the sea shore, so as to produce active sweating. Other substances, as earth and sulphur, salt and grain, have been used for arenation.

Insolation baths have enjoyed a high reputation. The body is wrapped up in the hide of an animal, or in leather, and then exposed to the heat of the sun until sweating takes place. Occasionally the body is turned so as to expose all sides to the sun about equally, not very unlike the operation of roasting a goose on a spit before the fire. The process is followed by washing in alum or sulphur water. Sometimes the patient is laid on a bed of wormwood, chamomile, sage, pennyroyal, or other herbs.

Epithems, *poultices*, and *fomentations*, which are really local baths, have been employed extensively both in ancient and modern times. Bags of heated sand, ashes, salt, oats, barley, etc., have each been supposed to possess peculiar virtues; while carrots, hard soap, basswood roots flaxseed, Indian meal, bread and milk, yolk of eggs, scraped

potatoes, with a great variety of barks, roots, and herbs have in thousands of instances filled the spectator with amazement by producing effects very like those of a common rag dipped in common water.

Sulphur fumigations were among the ancient baths; and several modern authors have written learned treatises on their employment for the itch. It is not many years since the administration of the Civil Hospitals of Paris appointed a commission of learned men to examine into the merits of the sulphur fumigating treatment in this disease. It may excite the risibles of those who have seen the itch effectually cured by a single soap-suds bath, to be told that among the many satisfactory conclusions to which the jury of investigation arrived was the fact that, "on an average, thirteen fumigations and a period of seven days were sufficient to cure the disease."

Vinegar fumigations have been employed since the days of Hippocrates. *Resinous*, *aromatic*, and *emollient herbs* have been employed in fomentations for 3000 years, and are in repute still.

General fumigations to the whole body, with a variety of mineral preparations, are now recognized processes of the allopathic materia medica. The articles in most common use are the mercurials—calomel, corrosive sublimate, and cinnibar—the protoxide of zinc, and deutoxide of arsenic.

Sulphuretted hydrogen gas, or *hydro-sulphuric acid*, is also employed in the same way.

Nitro-muriatic acid, for foot and other local baths, is a common prescription.

Pulmonary insufflation, called by some *atrimatrics*, has been lauded as a curative process in consumption and other diseases of the lungs. It consists mainly in inhaling some kind of foul air, made filthy by animal excrementitious matters, or by burning or smoking certain substances, so as to fill the room and the patient's lungs with their fumes, as turpentine, tar, gum, resin, styrax, vinegar, sugar, old leather, old rags, etc.

The terminal point of the ridiculous in this line of practice was reached when Dr. Beddoes published his book, recommending patients to sleep in cow stables, and inhale the fresh stench of that delectable locality, or, to speak learnedly, the "factitious gases," which are the common air mixed with exhalations from the skin, lungs, kidneys, and intestines of the animals. But Dr. Beddoes stands not alone in the glory of finding out cures for consumption. Almost all conceivable kinds of impure and disease-producing airs, as well as impure and disease-producing waters, have had the sanction of the medical profession as *remedies!*

Professor Reid gives us a list of thirty-four "factitious atmospheres," to be employed for medicinal purposes. The catalogue is worth recording, if for no other purpose, to aid some future virtuoso in making up a museum of obsolete medical curiosities: 1. Dry air; 2. Dry and hot air; 3. Dry and cold air; 4. Rapid and hot air; 5. Rapid and cold air; 6. Moist air; 7. Moist and warm; 8. Moist and cold; 9. Rapid, moist, and warm; 10. Rapid, moist, and cold; 11. Steamed air; 12. Highly oxygenated, by an admixture of oxygen; 13. Less oxygenating, by diluting air with nitrogen; 14. Deoxidating, by adding agents to abstract a part of the oxygen; 15. Nitrous oxide—intoxicating gas; 16. Nitrous acid; 17. Nitric acid; 18. Chlorinated; 19. Sulphurous; 20. Carbonic; 21. Ammoniacal; 22. Prussic; 23. Acetic; 24. Arsenical; 25. Mercurial; 26. Alcoholic; 27. Ethereal; 28. Benzoic; 29. Camphoric; 30. Lavender; 31. Orange; 32. Cinnamon; 33. Creosotic; 34. Hydro-sulphate of ammonia.

Iodine has lately found a place in medical books as a fumigator, or atrimatric agent.

Iodine with alcohol was introduced by Sir Charles Scudamore, who also employed the *tinctures of opium*, *conium*, *ipecac*, *deadly nightshade*, *digitalis*, *Prussic acid*, and *chlorine*.

The *hydriodate of potassa*, which is so frequently the efficiently evil agent in the sarsaparillas of the shops and the newspapers, is considerably employed atrimatrically.

Chlorine inhalation has had its day of fame in curing consumptions, the only drawback to which is the fact that the patients died.

Tobacco has had its merits confessed by the faculty. The smoke of tobacco cigars and camphor cigarettes has been recently recommended for affections of the throat, chest, and lungs, by the professors of our New York medical schools.

Peruvian bark, *oak bark*, *myrrh*, preparations of *iron*, *subnitrate of bismuth*, *hepar sulphuris*, *white vitriol*, *blue vitriol*, *alum*, *sugar of lead*, and *lunar caustic*, all reduced to impalpable powder, and applied by inhalation, are among the methods at the present time commended to us by living medical teachers, for the treatment of diseases of the air passages.

Gas baths are rather a modern notion. *Chlorine gas baths* have been exhibited for diseases of the liver, and *carbonic acid gas baths* are recommended for "every thing in general."

Soap baths are mentioned in medical books. They are certainly useful to those who do not wash frequently, and among medicated baths ought to rank as number one.

Medicinal water baths, made of the waters of our fashionable adui

terated springs, are employed more or less, and many imitations of them are manufactured at home. They are merely water impregnated with various mineral, earthy, alkaline, and saline ingredients. Any person, by throwing a handful of dirt, a shovelful of coal or wood ashes, a spoonful of salt, and a piece of chalk into a barrel of pure Croton water, can make as good a medicated bath, or as healthful a medicated drink, as can be found at Saratoga, Avon, or Cheltenham.

The *anæsthetic* agents, *ether* and *chloroform*, which are properly atrimatrics, are now well known, and, except for surgical purposes, are destined to have a short-lived popularity.

Finally, we have the *grease bath*. This is the very latest external application which has emanated from the allopathic school. It consists in rubbing the whole surface of the body frequently with various unguents, as fat bacon, hog's lard, suet, tallow, etc., etc. It originated with Dr. Schneeman, physician to the King of Hanover, and in treating eruptive fevers, and many other diseases, is highly recommended by Dr. Taylor, of England, and a Dr. Lindsly, of Washington City. As a species of factitious unction it deserves to rank with the factitious atmosphere practice of Dr. Beddoes.

Medical Testimony in Favor of the Remedial Use of Water.—From the days of Hippocrates to Priessnitz, the most eminent physicians of all countries have spoken almost as extravagantly in praise of the medicinal employment of water as do the hydropaths—the hydro-maniacs, as they are sometimes called, of the present time. Yet directly in the face of this testimony its employment as a remedial agent had steadily declined, until recently revived by the wonders told of Graefenberg.

Hippocrates wrote much in favor of the good effects to be derived from water both in health and disease. He declared that the bath, in cases of pneumonia, soothes the pain in the side, chest, and back, concocts the sputa, promotes expectoration, improves the respiration, and allays lassitude. He advised pouring cold water on inflamed and swelled joints, in gout and rheumatism, and in spasms, luxations, and fractures.

Galen placed water in the highest rank of his materia medica. He regarded the bath, followed by exercise and friction, as one of the chief parts of a system of perfect cure. He has left the following record: "Cold water quickens the actions of the bowels, provided there be no constrictions from spasms, when warm water is to be used. Cold drink stops hemorrhages, and sometimes brings back heat. Cold drinks are good in continued and ardent fevers. They discharge the

peccant and redundant humors by stool, or by vomiting, or by sweat." In biliousness, spasms, headache, fever of the stomach, hiccup, cholera morbus, obstinate ophthalmia, plethora, he recommended tepid and warm water-drinking, with the transition bathing—hot followed by tepid or cold.

Celsus, in treating affections of the head, directs a warm sweating bath, followed by the tepid and cold bath, with an additional quantity of cold water to the head. He recommends water in fullness of the stomach, headache, weak vision, deafness, tremors, sinking, pains in the joints, diarrhea, piles, and in hysterical and hypochondriacal affection; and praises the bath in low fevers, digestive disorders, and diseased kidneys. He also advises cold immersion in skin diseases and in hydrophobia.

Asclepiades, of Bithynia, though regarded as an empiric by the orthodox doctors of his day, advocated cold water internally and externally in hiccup, sour eructations, and nocturnal emissions.

Oribasius testified to the value of water-treatment in a manner similar to that of Galen.

Ætius directed baths in protracted fevers, convulsions, retention of urine, lassitude, and nervous pains, although he added to the water one fifth part of heated oil.

Rhazes advocated bathing in nearly all diseases. His water-treatment of small-pox was far more successful than any drug practice has proven since.

Avicenna was also a strenuous advocate for the watery regimen in a multitude of diseases, especially asthma, colics, and dropsy, He recommended infants to be bathed daily in tepid water. It is a sad pity that Avicenna, the Arabian Galen, has not more imitators in this respect among modern physicians.

Hoffman pronounced water a universal remedy. His language is: "We assert that water is a remedy suited to all persons, at all times; that there is no better preservative from distempers; that it is assuredly serviceable both in acute and chronic diseases; and, lastly, that its use *answers to all indications*, both of preservation and cure."

Boerhaave has written: No remedy can more effectually secure health and prevent disease than pure water.

Haller, as a testimonial of its value, drank nothing but water; and the same is recorded of *Demosthenes*, *Milton*, and *Locke*.

Floyer certifies: Water resists putrefaction and cools burning heat and thirst, and helps digestion. He recommended cold bathing in a variety of diseases.

Baynard supposed good water to possess healing and balsamic properties. He was a strong advocate for bathing as a remedy.

Gregory regarded water as a tonic to the digestive organs.

The celebrated *Cheyne* exclaimed: Without all peradventure, water was the primitive original beverage, and is the only simple fluid fitted for diluting, moistening, and cooling.

Macquart in an especial manner recommended men of science and letters to make water their favorite drink, assuring them that their ideas would be more precise, their judgment sounder, and their senses more delicate.

Londe, and *Levy*, French authors on hygiene, speak emphatically in favor of the utility of water in preserving health.

Sir John Ross, *Miller*, and other Northern navigators, have testified that exclusive water-drinkers endure the rigors and withstand the diseases of the frigid zone better than any other persons.

Dr. Jackson, and *Mr. Marshall*, of the British army, and *Drs. Mosely*, and *James Johnson*, of London, assure us that the dangers of living in tropical climates are the least for the pure water-drinkers, and that these are far less liable to the diseases of acclimation.

Haly Abbas, and *Mesues*, Arabian writers, prescribed bathing in most diseases, and their directions for conducting the processes were generally singularly judicious.

Alsaharavius, Arabian, recommends bathing to moisten the body, open the pores, dispel flatulence, remove repletion, procure sleep, relieve pain, fluxes of the bowels, and lassitude, restore lean bodies to plumpness, soften contracted limbs, etc.

Lanzani, Italian, commended large doses of cold water internally as the best remedy for fever, and wrote two elaborate books to explain the grounds of his practice.

Fra Bernardo, Sicilian, acquired, in the early part of the last century, the title of "cold-water doctor," and won a high reputation for curing affections of the chest, palpitations, convulsions, obstinate dyspepsia, diarrhea, dropsy, hemorrhages, gout, and rheumatism, by water-treatment. He used iced-water freely internally, and applied ice to hot and inflamed parts. All food was withheld during the first four days—a point in practice which our beef-tea, mutton-broth, and chicken-soup slopping and stuffing doctors would do well, for their patients to imitate.

Cirillo, Neapolitan, in 1729, treated a malignant fever, which prevailed at Naples, with what he called "the watery diet." He administered a pint or two of water, cooled by snow, every two hours for several days, permitting no kind of aliment whatever. When free perspira-

tion took place the drink was omitted, and very light food allowed. He directed cold applications of snow to painful and inflamed parts, but did not prescribe general bathing.

Rovida, of Arragon, is said to have practiced the water-treatment extensively on the plan of Cirillo and Fra Bernardo.

Samoilowitz, Russian in 1771, experienced signal success in treating the plague at Moscow, by means of cold acidulated drinks, and frictions to the whole body, with pounded ice.

Rev. John Hancock, an English clergyman. in 1722, published a tract in advocacy of water as the best remedy for fevers and the plague. He cured agues, scarlet fever, small-pox, measles, jaundice, and coughs, by copious water-drinking.

John Smith, C.M., English, wrote a book about a century ago, which is full of testimonials to the curative powers of water in nearly all the prevalent diseases of the day. Its title was, "The Curiosities of Common Water," and a large proportion of its pages is a compendium of the opinions of many celebrated physicians in favor of the employment of water as a general remedy. Among his authorities are *Manwaring*, *Keill*, *Prat*, *Duncan*, *Elliot*, *Allen*, *Harris*, *Van Heyden*, and *Pitt*, all eminent in the medical profession.

Geoffrey, French, more than a century ago, advocated the free use of water as a preventive of the plague.

Hecquel, French, about the same time, advocated the use of water as an almost universal specific.

Pomme, French, at a later period, wrote in favor of cold water-drinking and warm bathing for various remedial and hygienic purposes, and particularly for the treatment of hysterical and hypochondriacal disorders.

Rondeletius, French, published cases of gout cured by cold water as a beverage, as also did his countryman, *Martinus*.

Riverius, French, treated female complaints, particularly mismenstruation, successfully by the use of water alone.

De Hahn, German, directed free bathing and cold water-drinking during an epidemic fever at Breslau, in 1737, and his practice was far more successful than that of his competitors, who persisted in the employment of active drugs.

Theden, German, employed cold water and ice successfully in strangulated hernia, inflammations, malignant fevers, and small-pox.

Sturm, a Polish surgeon, testifies to the successful treatment of epidemic cholera, by means of as much warm water as the patients were able to drink, a glassful being administered every ten or fifteen minutes.

Those celebrated medical philosophers and physicians, *Harvey Louret*, *Cocchi*, *Sanctorius*, *Marziano*, and *Barthez*, advocated and practiced cold applications to gouty swellings, and inflammations.

Ambrose Pare declared that the true vulnerary, or dressing for wounds, was water alone.

Michael Angelo Blondi, Italian, wrote an essay, in 1542, on water as a remedy for gun-shot wounds.

Gabriel Fallopius, of Venice, *Felix Palatius*, of Trebia, and *Joubert*, *Martel*, and *Lamorier*, of France, strongly advocated water-dressings in surgical cases, instead of the more mystified and often mischievous plasters, balsams, liniments, lotions, or poultices.

Larrey, the most celebrated operative surgeon France ever produced, used water-dressings generally.

Kern, of Austria, praised the uses of water in the treatment of wounds, and even laid claim to the discovery of its superior merit.

M. Jose, of Amiens, recommended cold water in the treatment of wounds, burns, phlegmons, erysipelas, and gangrene.

Macartney, of Dublin, advises the free and methodical employment of water-dressings in wounds With him *irrigation* was a favorite mode of application.

Lancassani, in 1753, *Caldani*, in 1767, *Leanter*, in 1780, and *Percy* in 1785, published conclusive evidences of the superiority of water alone to all the medicated fluids and compounds known, for surgical diseases.

Dr. Wright, of England, in 1777, employed cold ablutions extensively and successfully in the treatment of fevers.

Dr. Currie, of Liverpool, commenced the treatment of fevers by cold affusions in 1787. For several years he treated scarlet and typhus fevers, small-pox, and other diseases, principally by bathing, and with a success universally admitted to have been far greater than that of the ordinary drug-treatment. His work on the subject was published in 1797.

Dr. Robert Jackson, of the British army, had equal success in the same practice, the facts of which he published in 1791, at which time he had been in the habit of treating fevers by cold affusions for nearly twenty years.

Giannini, of Milan, strongly recommends cold immersion in typhus and petechial fevers.

Dr. Thaer, of Prussia, in 1825, treated measles by cold bathing, and with remarkable success, as compared with his drugging contemporaries.

Dr. N. Smith, of New Haven, Conn., was in the habit of dashing cold water on the bodies of patients in cases of typhoid fever, so as to drench both the body linen and bedding.

Dr. Forbes, present editor of the ablest medical journal of Europe, and one of the physicians to her Majesty Queen Victoria, confesses that in a large proportion of the cases of gout and rheumatism the Water-Cure seems to be extremely efficacious. He says further: "In that very large class of cases of complex disease, usually known under the name of chronic dyspepsia, in which other modes [Why wait to try "other modes?"] of treatment have failed, or been only partially successful, the practice of Priessnitz is well deserving of trial. In many chronic nervous affections and general debility we should anticipate great benefit from this system. In chronic diarrhea, dysentery, and hemorrhoids the sitz bath appears to be frequently an effectual remedy."

Dr. John Bell, author of the ablest historical work on bathing extant, has treated scarlatina in the Pennsylvania Hospital for many years by cold bathing, with the most satisfactory success. Although he does not entirely reject all other remedies, he admits that there is no other remedy than water which unites, to any thing like the same extent, efficacy with safety and immediately pleasurable results. He says: "How often have I seen the little sufferer, with burning heat and delirium, and unable to obtain sleep or repose of any kind, tranquillized immediately by the cold affusion, and fall into a sweet and refreshing sleep immediately afterward."

Such is a part of the testimony volunteered by the regular profession in favor of the system we advocate. The reader will bear in mind that nearly all the authorities thus far quoted are eminent authors, professors and practitioners of the allopathic school. After examining such a flood of evidence in favor of nearly all that is claimed by the hydropathists, the question naturally arises, Why is it, if regular physicians, in all ages, and of all countries, have found water-treatment so superior in the great mass of human maladies, that the medical faculty of the present day, as a body, employ it so little, in fact almost wholly neglect it, nay, bitterly and vehemently oppose it? This is indeed a strange problem, but it can be solved.

The minds—professional minds—of medical men of this day are as mystified and twistified, as superstitious and fantastical, as irrational and absurd, so far as *medical* logic is concerned, as were the minds of medical men in that by-gone age when charms, magic, incantations, and necromancy were among the remedial resources. And so their minds will remain until they have some fixed basis, some settled principles to reason from. A man may be in possession of any amount of book knowledge, he may know all the facts of all the sciences in existence, yet if he does not recognize the principles to which those facts

relate, his writing and his talking may be unintelligible jargon, and his practice a promiscuous medley of truth and error. A man may understand all the letters of the alphabet, and all the words of the dictionary, and yet make bad words and sentences unless he is also acquainted with the principles of the construction of language.

The ancient priests and monks placed their patients in airy, salubrious situations, enjoined strict abstemiousness or the simplest food, gave water for drink, and prescribed sufficient washing or bathing for thorough cleanliness, and then performed their magical ceremonies. Their patients recovered; nature worked the cure, and the doctor got the credit.

Our more learned modern physicians, more abundantly supplied with disease-killing missiles, permit or recommend the grossest food, give poisoned or drugged waters instead of pure, pay scarcely any attention to hygienic regulations, bathe insignificantly, empirically, or not at all, and pour down the powerful remedies. Their patients die; nature gets the blame, and the doctor is excused, for surely no one could have done more!

The rock on which the water-treatment has ever been wrecked is eclecticism. Few minds, such is the bias of education, seem able to comprehend how it can be possible for a disease to be removed without a *little* medicine of some sort. It may be *very* little, infinitesimal, the thirtieth dilution, or a ten-millionth part of a drop of the tincture of a shadow, or the weakest decoction of catnip or canary seed; still it must be something *un*natural, or nature cannot be assisted! And if medicine of any kind or any strength is employed as an auxiliary, notwithstanding the use of water is regarded as the leading medication, the little, charming, mysterious influence of the drug will gradually gain upon the imagination, and in the end expel the water part of the practice as surely as weeds will run out flowers in an uncultivated field. It is like mixing brandy and water to make a beverage. Every one will admit that in such an admixture the water is the only strictly necessary and useful part of the drink; yet by employing them in combination no man ever had his taste for water increase, and that for brandy decrease. The contrary has always been the fact. The safety and the ultimate triumph of the Water-Cure system depends on keeping it clear of all "entangling alliances," and on that alone.

PART I.

ANATOMY.

Definitions.—Anatomy is the science of the structures of an organized body. An *organized* body consists of an assemblage of parts, each of which is called an *organ*, and all mutually related to, and dependent on, each other. All organized bodies are either *animal* or *vegetable* *Comparative anatomy* teaches the structures of animals. Human anatomy contemplates a knowledge of the structures of all the organs and parts of the human body, and their relations to each other.

Those structures which exist in all parts of the body are called *general*; those which are found only in particular parts are termed *special*. The entire organism consists of *solids*, in different degrees of density, and *fluids*, which circulate through them. The solids are *bones*, *teeth*, *cartilages*, *ligaments*, *muscles*, *nerves*, *vessels*, *viscera*, *membranes*, *skin*, *hair*, and *nails*. The fluids are *blood*, *chyle*, *lymph*, *saliva*, *gastric juice*, *pancreatic juice*, *synovia*, *mucus*, and *serum*. Bile, sweat, urine, etc., are excretions.

Organic Elements.—Reduced to their *ultimate* constituents by chemical analysis, almost the entire bulk of the body, except the bony tissue, is found to consist of *oxygen*, *hydrogen*, *nitrogen*, and *carbon* The bones and teeth contain a large proportion of *phosphate* and *carbonate of lime*. A very small proportion of other substances, considered to be elementary, are regarded by chemists as essential constituents. These are *phosphorous*, *sulphur*, *silicon*, *chlorine*, *iodine*, *bromine*, *fluorine*, *potassium*, *sodium*, *calcium*, *magnesium*, *iron*, *manganese*, and *aluminum*. To this list some late chemists have added *arsenic* and *copper*; and even *lead* and *gold* have quite recently been found in organized bodies, and have quite absurdly been put down as constituents.

Some of these elements, however, are only occasionally found in the human body, particularly arsenic, copper, lead, and gold; hence a more

rational inference is, that they are accidental ingredients, instead of elementary constituents.

When it is considered how extensively metallic substances and mineral preparations are employed as medicines, and how generally metallic vessels, liable to oxidation, are used in cooking, to say nothing of the casual admixtures of drugs kept about dwellings, for various domestic purposes, with the articles of food and drink, it need not be surprising that chemists should now and then detect ingredients in the solids and fluids of the human body which have no natural relation to the organism, save as incidental poisons.

Proximate Principles.—The combination of the ultimate elements in various proportions forms the different organic substances called *proximate* elements, or principles. The most important are *albumen*, *fibrin*, and *gelatin*, which form the basis of the nervous, muscular, and cellular tissues. The refinements of chemical analysis have added or produced several other substances, which are put down as proximate. Most prominent among them are *osmazome*, procured by steeping muscular flesh in water or alcohol; *pepsin*, found in the gastric glands; *globulin*, in the blood corpuscles; *spermatin*, in the semen; *keratin*, in the hair and skin; *hematin*, in the bile, etc.

Most of these are probably mere products of the process of analysis; and there is no end to the "elements," proximate or ultimate, that could be produced by subjecting animal matters to chemical actions and re-agents. Thus chemists, in experimenting upon the bile, have already "found," as distinct principles, *bilin; fellinic acid; cholinic acid; taurin; dyslysin; cholepyrrhin; biliphæin; biliverdin; bilifulvin; cholesterin; oleate*, *mangarate*, and *stearate of soda; chloride of sodium; sulphate*, *lactate*, and *phosphate of soda; phosphate of lime.* I can see no reason why a hundred or a thousand others may not be developed by similar experiments, which certainly tend much more to the complication of scientific words and phrases than to the demonstration of true science.

Tissues.—Each distinct solid structure is called a *tissue*. All tissues, however diversified in form, are produced from cells originating in a mass of soft, liquid matter, and they present the same general characteristics in all parts of the body. Every portion of the animal organism is formed of nucleated cells, which are constantly maturing, and as the body is undergoing continual decay and reproduction, they are always found in various stages of development.

The divisions of tissues, and their vital properties, will be treated of in the physiological part of this work.

CHAPTER I.

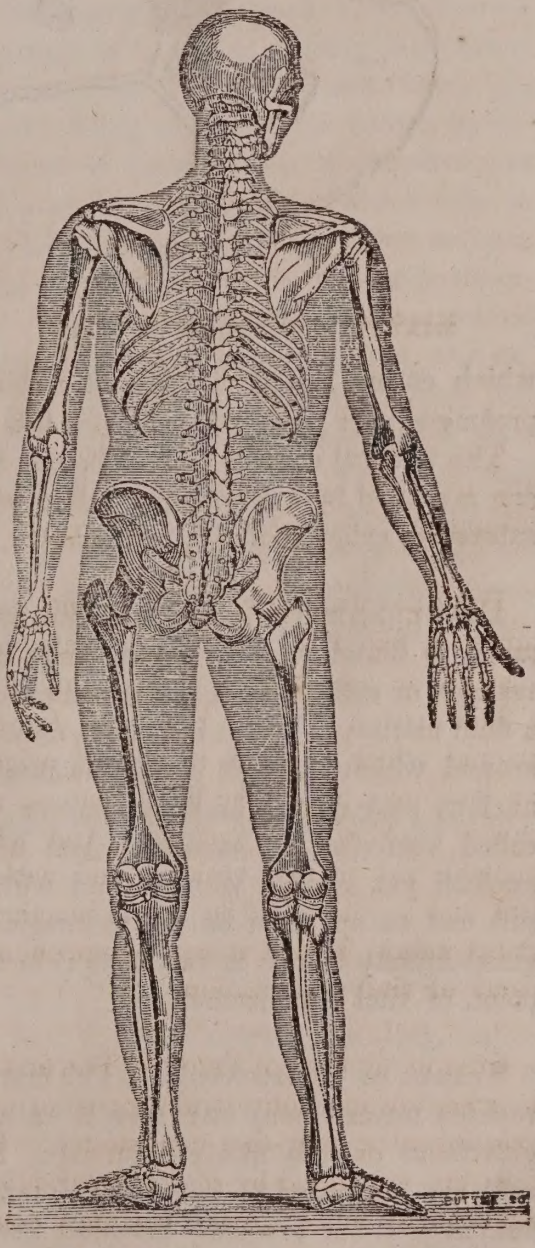
OF THE BONES—OSTEOLOGY.

The osseous structure constitutes the framework of the body. It gives form, firmness, and individuality to the physiological character and affords surfaces and points for the connection of ligaments which hold the bones in position, and the attachment of muscles which move them. The proportion of the bony structure to the general bulk may be seen at a glance in Fig. 1.

The proximate constituents of bone are—

Cartilage . .	(parts)	32.17
Blood-vessels		1.13
Phosphate of lime . .		51.04
Carbonate of lime . .		11.30
Fluate of lime		2.00
Phosphate of magnesia .		1.16
Soda, chloride of sodium		1.20
		100.00

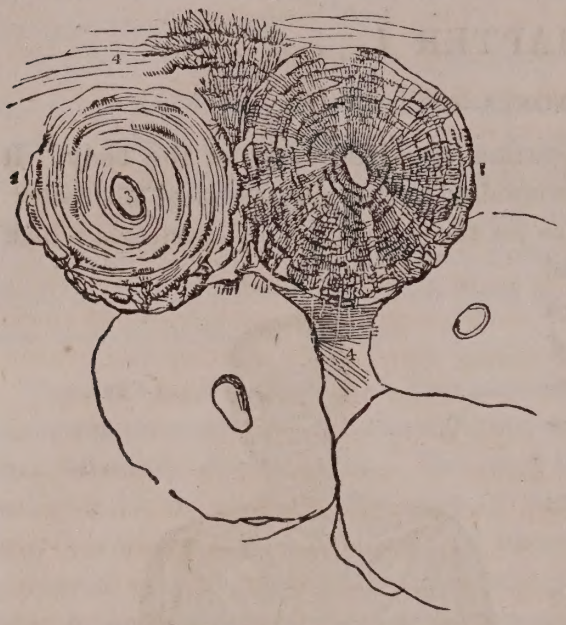
Fig. 1.



RELATION OF BONES TO BULK.

Structure of Bone.—The bony structure is a dense, compact, subfibrous basis, filled with minute cells, and traversed in all directions by branching and inosculating canals, called Haversian, which give passage to vessels and nerves. These cells are irregular in form and size, and give off numerous branching tubes, which, by communicating with each other in various directions, constitute a very delicate network

Fig. 2.



MINUTE STRUCTURE OF BONE.

A microscopic view of the minute structure of bone is shown in Fig 2. 1. One of the Haversian canals, surrounded by concentric lamellæ. 2. The same, with the cells and tubuli. 3. Area of one of the canals. 4 4. Direction of the medullary, or central canal. The upper part of the cut represents several long corpuscles, or cells, with their tubuli; the lower part exhibits the outlines of several other canals.

INVESTING MEMBRANE.—All the bones are invested with a dense fibrous membrane, called *periosteum*, except at their articulating surfaces, which are lined by a thin layer of cartilage. That portion of the periosteum which covers the skull bones is called *pericranium*; and when it is prolonged over external cartilages, it is termed *perichondrium*.

The internal cavities of long bones, and the canals and cells of others, are lined by a membrane called *medullary*, and filled with an oily substance, called *medulla*, or marrow.

DEVELOPMENT OF BONE.—The osseous, like all organized structures, is found to exist primordially in a state of extremely minute vesicles, or cells. Each cell is composed of a thin membrane, enclosing a fluid matter, in which is a small, denser mass, constituting the *nucleus* around which the cell itself was originally developed. Within each nucleus may usually be found one or more smaller granules, or cells, called *nucleolus*, or *nucleoli*. And whether there are within these nucleoli yet smaller vesicles, and within them more minute nucleoli still, and so on, must be left to imagination. The human mind must grasp infinity before it can comprehend the primal atom, or starting-point, of vital organization.

STAGES OF OSSIFICATION.—The first recognizable change of ordinary vesicles toward bony structure is an assemblage of minute cells, of a *gelatinous* or jelly-like consistence. In the process of growth these cells are separated by *intercellular substance*, which is transparent and fluid at first, but gradually becomes condensed and opake. Then the *cartilaginous* stage of ossification exists. In the cartilaginous substance

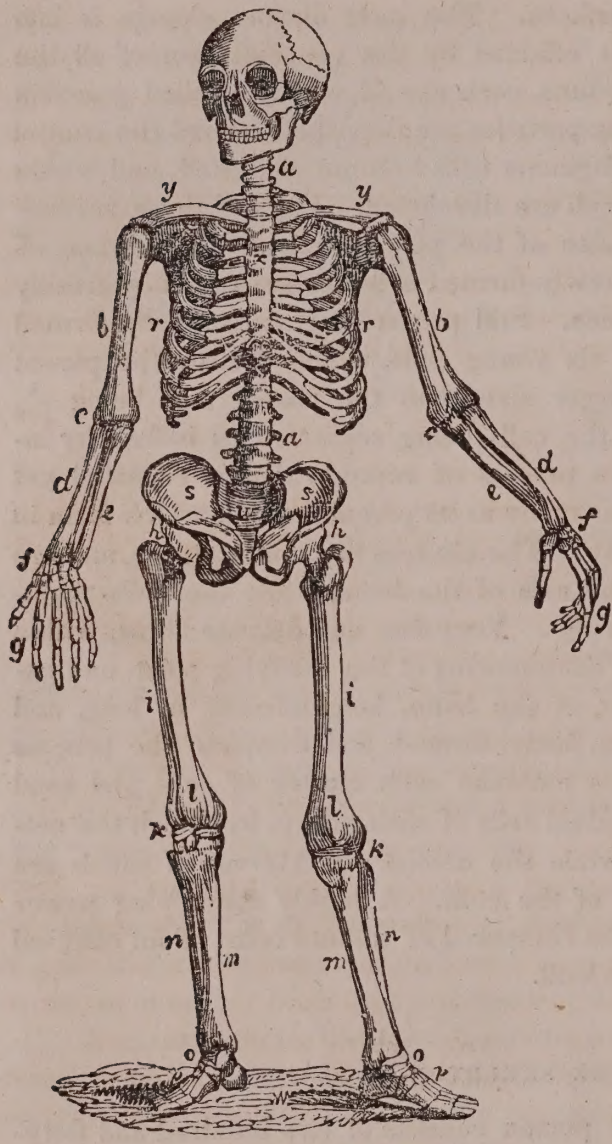
vascular canals are formed by a union of cells in rows, and the liquefaction of the adhering surfaces. The next distinct change is into osseous substance. This is effected by the concentration of all the vascular canals to central points, each one of which is called *punctum ossificationis*. As the earthy particles are deposited around the central point, the surrounding cartilaginous cells become elongated, and within each cell two or three nucleoli are developed. Each of these secondary cells soon attains the size of the parent cell, the membrane of which disappears, and the newly-formed cells are separated by freshly effused intercellular substance. Still progressing, each newly-formed cell produces four, five, or six young cells, which destroy the parent membrane, and attain a larger size than the parent cell, being $\frac{1}{1500}$ of an inch in diameter, all the cells being separated as before by intercellular substance. This process of reproduction is repeated yet again, each cell producing as many as its parent before, which form in clusters of from thirty to fifty. The clusters are oval in figure, and are disposed longitudinally to the axis of the bone, while the cells themselves are arranged transversely. Very fine and delicate fibres, within the intercellular substance, commencing at the ossifying point, and extending through every part of the bone, longitudinally in long, and radiatingly in flat bones, are, lastly, formed, and complete the process of ossification. These fibres embrace each cluster of cells, and send branches between the individual cells of each group, by which the network of bone is formed, while the *areolæ* and Hervasian canals are formed by the conjunction of the cells. A highly magnifying power shows the ossific fibres to be composed of minute cells, of an elliptical form, and having central nucleoli.

THE SKELETON.

The skeleton of an adult person consists of two hundred and forty-six distinct pieces:

Bones of the head	8	Breast—sternum	1
Ear—ossicula auditûs	6	Pelvis—hip, sacrum, and coccyx	4
Face	14	Lower extremities—leg, instep, and toes	60
Teeth	32	Sesamoid—kneepan, and bones in tendons	8
Back—vertebral column	24		
Ribs—twelve pairs	24		
Tongue—os hyoides	1		
Upper extremities—arm, wrist, and fingers	64		246

Fig. 3.



OSSEOUS SYSTEM.

Anatomists distinguish three kinds of bones: the *long*, *flat*, and *irregular*. The long appertain to the limbs, the arms, legs, fingers, and toes; the flat enclose cavities, as the brain and pelvis; the irregular are mostly found about the base of the skull, face, trunk, wrist, and instep.

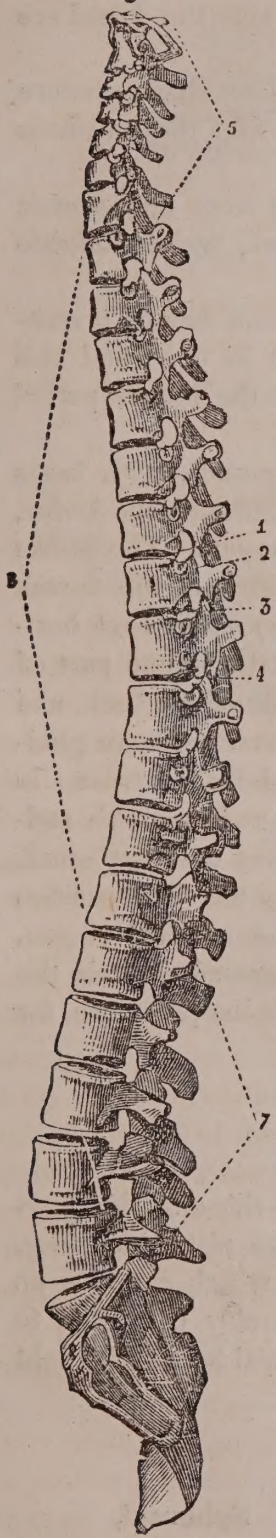
VERTEBRAL COLUMN.

The bones of the back, constituting the vertebral column, are divided into thirty-three pieces in the young person, but in advanced life the nine lower pieces unite into two. Each piece is called a *vertebra*. The whole are divided into *true* and *false*. The *true* are the twenty-four upper ones, and the *false* are the nine lower ones. The true are subdivided into *seven cervical*, belonging to the neck, *twelve dorsal*, forming the central portion of the back proper, and *five lumbar*, pertaining to the loins. The *false* are divided into the *sacrum*, which consists originally of five pieces, and the *coccyx*, originally consisting of four pieces.

The vertebral column is the central axis of the body, and the part of the skeleton first developed in all vertebrated animals.

Each vertebra, except the upper cervical, which has no body, consists of a *body*, by which it is articulated with the adjoining vertebræ; two *laminæ*, or plates, which arch backward and enclose the passage for the spinal cord; a *spinous process*, which projects backward for

Fig. 4.



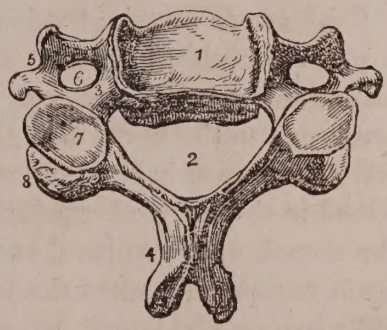
VERTEBRAL COLUMN.

the attachment of muscles; *two transverse processes* projecting laterally from each side of the laminæ for the attachment of muscles; and *four articular processes*, which project upward and downward from the laminæ, for articulation with adjoining vertebræ

Fig. 4 represents the vertebral column entire, seen from the left side. 1. Two semi-facettes, which articulate with the head of the rib. 2. Spinous process. 3, 4. Two foramina, each resulting from the union of two vertebræ. 5. Cervical region and its corresponding curve. 6. Dorsal region and its corresponding curve. 7. Lumbar region and its corresponding curve. 8. Sacrum.

The distinctive parts of a vertebra are seen in Fig. 5. 1. The body, concave in the centre, and rising into a sharp ridge on each side. 2. The lamina. 3. The part called pedicle, rendered concave by the superior intervertebral notch. 4. Spinous process, its extremity bifurcated. 5. Transverse process. 6. Vertebral foramen. 7. Superior articular process. 8. Inferior articular process.

Fig. 5



A CERVICAL VERTEBRA.

The *first cervical vertebra* supports the head, from which circumstance it is called the *atlas*. It is a simple ring of bone, and moves laterally, as well as forward and backward to some extent on the second cervical, which is called the *axis*.

The *axis* has a large body, and a strong, tooth-like process, called *odontoid*, which rises perpendicularly, and is articulated with the anterior arch of the atlas, while its posterior surface is firmly bound by a strong transverse ligament.

The atlas (turning on the axis) moves the head, as though it were turning on a pivot.

The *seventh cervical* is called *prominens*, because its spinous process projects backward beyond the others, forming the prominent part of the back of the neck. This prominence is terminated by a tubercle, to which the strong ligament of the neck *ligamentum nuchæ*, is attached.

The *dorsal* vertebræ are marked on each side by articulating surfaces, *facets*, for receiving the head of the ribs. In size the dorsal are midway between the cervical and lumbar.

The *lumbar vertebræ* are the largest; their bodies are thicker before than behind; their spinal cavity is large and oval, and their spinous processes are thick and broad.

The *sacrum* is of a triangular figure, concave in front and convex posteriorly. It is marked by four transverse ridges, which indicate the consolidation of five separate pieces.

The *coccyx*, which terminates the vertebral column below, is composed of four small pieces, which gradually unite in one; and this one becomes consolidated to the sacrum soon after the middle period of life.

The *whole vertebral column* represents two pyramids, with bases applied to each other; the sacrum and coccyx constituting the lower, and all the vertebræ, except the atlas, forming the upper. The *bodies* are broad in the cervical region, narrower in the middle of the dorsal, and again broad in the lumbar region. The *spinous processes* are horizontal in the cervical, gradually becoming oblique in the upper part of the dorsal, nearly vertical and inbricated in the middle of the back, and again horizontal toward the lower part. The *transverse processes* gradually increase in length from the axis to the first dorsal vertebra; in the dorsal region they project obliquely backward, and diminish suddenly in length in the eleventh or twelfth, where they are very small. The *intervertebral foramina* are openings formed by the juxtaposition of the vertebral notches; they are smallest in the cervical region, gradually enlarging to the lumbar. The *vertebral groove* extends the whole length of the column on either side of the spinous processes, for lodging the principal muscles of the back.

BONES OF THE SKULL.

They are divided into those of the *cranium*, and those of the *face*. The cranial, like all flat bones, are formed with two plates, or tables, and an intervening cellular network, called *diploe*, which contains an oily, medullary substance. This structure is admirably calculated to protect the brain from shocks, blows, etc. The cranial bones are eight in number, and the facial fourteen:

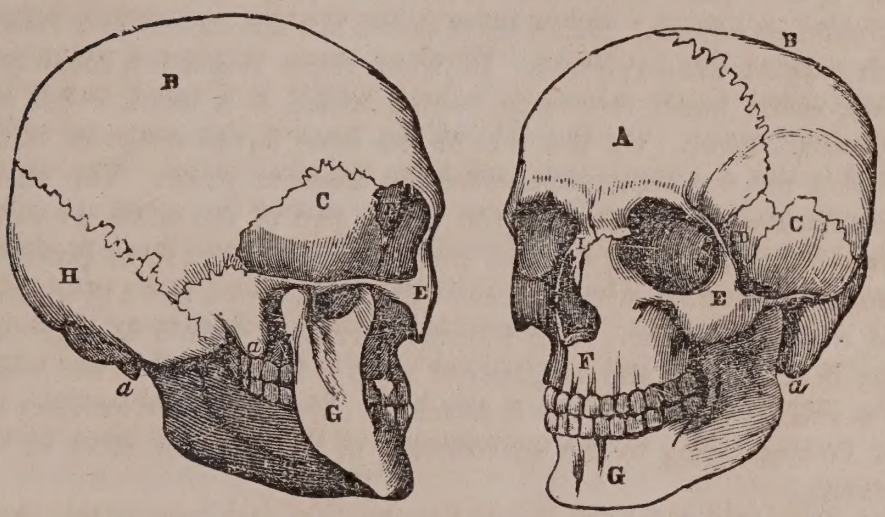
Cranial Bones.

Occipital,	Frontal,	Sphenoid,
Two parietal.	Two tempora.	Ethmoid.

Facial Bones.

Two nasal,	Two palate,
Two superior maxillary,	Two inferior turbinated,
Two lachrymal	Vomer,
Two malar,	Inferior maxillary.

Fig. 6.



BONES OF THE HEAD.

In Fig. 6, A represents the frontal bone. B B. Parietal. C C. Temporal. D D. Sphenoid. E E. Malar. F F. Superior maxillary. G G. Inferior maxillary. H. Occipital. I. Nasal. *a a*. Mastoid process of the temporal bone.

The *Occipital bone* forms the base and back part of the cranium. Its external surface is marked by *two transverse ridges;* in the middle of the upper one is a projection, at which point the bone is very thick and strong. Tyros in phrenology have sometimes mistaken this projection for the *bump of parentiveness*. About an inch below this projection is the *foramen magnum*, a large opening for the connection of the spinal cord with the brain. On each side of this orifice are processes, called *condyles*, for articulating with the atlas. The internal surface of the occipital bone is divided by a *crucial ridge* into four *fossæ*. In the upper fossæ are lodged the posterior lobes of the cerebrum, and in the two inferior the lateral lobes of the cerebellum. In front of the foramen magnum is a projection called the *basilar process*, on which rests the medulla oblongata.

The *Parietal bones* are quadrilateral in form, situated at the side and vertex of the skull, and connected with each other by a straight suture, called *sagittal*. On the externa surface of each bone is an arched

line, called the *temporal ridge*. The internal surface is marked by numerous furrows, which lodge the ramifications of the middle meningeal artery, and by *digital fossæ*, corresponding with the convolutions of the brain.

The *Frontal bone* is situated at the anterior part of the cranium, forming the forehead, and a part of the roof of the nostrils and orbits of the eyes. Each lateral half of the bone projects forward, forming the *frontal eminences*. Below these points are the *superciliary ridges*, which support the eyebrows. Between these ridges is a rough projection, called *nasal tuberosity*, behind which is a canal, called the *longitudinal sinus*. On the side of the bone is the *temporal ridge*, and below this is a depression, called the *temporal fossæ*. The sharp, prominent arches, which form the upper part of the orbits are called the *internal* and *external angular processes*. Between these processes is a rough excavation, which receives the nasal bones, and a projection, called the *nasal spine*. The internal surface is divided by a grooved ridge; in the groove the longitudinal sinus is lodged, and to the edges of the ridge the *falx cerebri* is attached. On the orbital portions are *fossæ* corresponding to the convolutions of the anterior lobes of the cerebrum.

The *Temporal bones* are situated at the side and base of the skull, and are divided into squamous, mastoid, and petrous portions.

The *squamous* portion forms the anterior part of each bone, and the thin, translucent part of the temple. A long, arched process projects from its external surface, called the *zygoma*. Its internal surface is irregularly depressed by the convolutions of the cerebrum.

The *mastoid* portion forms the back part of the bone. Beginners in phrenological science, on feeling behind the ears, have often mistaken its projection for an enormous "combativeness." It is thick, rough, and pierced with numerous holes for the passage of very small arteries and veins. Interiorly, a part of it is excavated into numerous cells, which belong to the organ of hearing. In front of it is the *meatus auditorius externus*, or external ear passage.

The *petrous* portion is extremely hard and dense. In shape it is a three-sided pyramid. Near the middle of its posterior surface is the entrance of the *meatus auditorius internus*, about one third of an inch in depth. At the bottom of the meatus is a fossa, called *reniform;* it is divided by a sharp ridge into an upper and lower compartment; this ridge is prolonged for some distance upon the anterior wall of the meatus, and marks the situation of the facial and auditory nerves, which constitute the seventh pair, and enter the meatus.

The *basilar surface* is rough and irregular, and assists to form the

under surface of the base of the skull. To a smooth fossa, called *glenoid*, the condyle of the lower jaw is articulated. At the inner angle of this fossa is the foramen of the Eustachian tube.

The *Sphenoid bone* is situated at the base of the skull, and enters into the formation both of the cranium and face. Its shape has been compared to a bat with its wings extended. It is divided into a central portion, or *body; lesser wings*, consisting of two small triangular plates projected from the anterior and upper part of the body; *greater wings*, expanding laterally from each side of the body; *spinous processes*, extending backward from the base of the greater wings; and *pterygoid processes*, extending downward from the greater wings. On the *superior surface* of its body are seen the *optic foramina*, which transmit the optic nerve and ophthalmic arteries. The *posterior surface* is flat, rough, and articulated with the basilar process of the occipital bone. The *lesser wings* form the posterior parts of the roof of the orbits, and are traversed by the optic foramina. The *greater wings* form part of the middle fossæ of the base of the skull, and assist in forming the outer walls of the orbits. The external border of the *spinous process* is articulated with the squamous portion of the temporal bone; its internal border is grooved for the reception of the Eustachian tube. The *pterygoid processes* form the lateral boundaries of the posterior nares.

The *Ethmoid bone* (sieve-like) is a square, cellular bone, between the orbits at the root of the nose. It is named from a number of small openings which perforate the surface. It consists of a thin *central plate*, which assists in forming the septum of the nose, and *two lateral masses*. From the upper part of the septum a strong process projects into the cavity of the skull, called *crista galli*, to which the falx cerebri is attached. On each side of the crista galli is a grooved plate perforated by numerous openings, the *cribriform lamella*, which supports the bulb of the olfactory nerve, and gives passage to its filaments, and also to the nasal branch of the ophthalmic nerve.

The *lateral masses* are composed of cells. The internal surface forms the external boundary of the upper part of the nasal fossæ. The external surface enters into the formation of the inner wall of the orbit. What is called the *superior turbinated bone* is a thin, curled plate of the internal surface, constituting the upper margin of a narrow fissure—the *superior meatus* of the nose. Below the meatus another thin plate curls outward; it is called the *middle turbinated bone*.

The *Nasal bones* are small, quadrangular pieces, forming the bridge and base of the nose. They are convex superiorly and slightly con-

cave on their under surface, which is grooved for the nasal branch of the ophthalmic nerve.

The *Superior Maxillary bones* form the whole of the upper jaw, and assist in forming the orbit, nose, cheek, and palate. The *body* of each is triangular; its interior is hollow, forming the *antrum;* and its lower part presents the *alveolar processes*, for containing the upper teeth. The *posterior surface* forms part of the *zygomatic fossa*, over which a projection extends to the malar bone, called the *malar process.* A process called *nasal* articulates with the frontal and nasal bone. Between the opening of the antrum, which is an irregular hole on its nasal surface, and the nasal process, is a deep vertical groove, called *sulcus lachrymalis*, which is formed into a canal by the lachrymal and inferior turbinated bones, constituting the nasal duct. The margin of the nasal process is marked by a small tubercle, which serves to guide the knife of the surgeon in operating for fistula lachrymalis. The *palate process* projects horizontally inward—its upper surface forming the floor of the nares, and its under surface a part of the roof of the mouth.

Each *Lachrymal bone* is a thin, oval plate, situated at the anterior and inner angle of the orbit of the eye. A portion of its *external surface* assists in forming the orbit; another portion is concave, and lodges the lachrymal sac. The *internal surface* assists in forming the nasal fossæ and nasal duct.

The *Malar bones* are the quadrangular pieces which form the prominences of the cheeks. The *external surface* of each has many small openings for the passage of filaments of nerves and minute arteries. A process, called *frontal*, ascends to articulate with the external angular process of the frontal bone, and form the outer border of the orbit. It is united to the zygoma of the temporal bone by a process called *zygomatic*, and to the superior maxillary by the *maxillary process.*

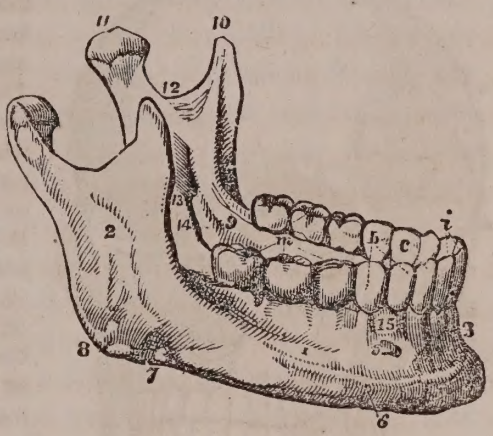
The *Palate bones* are situated at the back part of the nares, and enter into the formation of the palate, side of the nose, and the posterior part of the floor of the orbit. Each bone resembles the letter L, the perpendicular and horizontal portions presenting each two quadrilateral surfaces.

The *Inferior Turbinated bones* are light, spongy, irregularly curved bones, projecting inward toward the *septum narium*, or partition of the nose. Each one is attached to the maxillary bone in front, and the palate bone behind.

The *Vomer* is a thin quadrilateral piece, forming the back and lower part of the septum of the nose

The *Inferior Maxillary bone*, or lower jaw, is an arch of bone containing the under row of teeth. Its distinctive parts are shown in fig. 7.

Fig. 7.



LOWER JAW.

1. The body. 2. The ramus. 3. The symphisis, or point of union. 4. Fossa for the depressing muscle of the lower jaw. 5. Mental foramen. 6. External oblique ridge. 7. Groove for the facial artery. 8. The angle. 9. Extremity of the milo-hyoidean ridge. 10. Coronoid process. 11. The condyles, which articulate with the glenoid cavity of the temporal bone. 12. Sigmoid notch. 13. Inferior dental foramen. 14. Milo-hyoidean groove. 15. Alveolar process. *i*. The middle and lateral incisor tooth of one side. *l*. The canine tooth. *b*. The two bicuspids. *m*. The three molars.

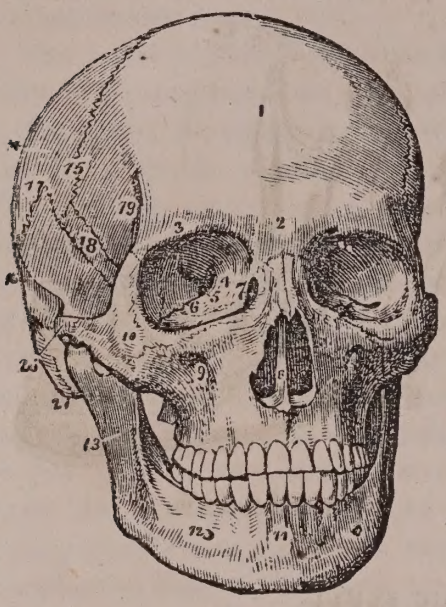
SUTURES OF THE SKULL.

The bones of the skull are connected with each other by sutures (*sutura*, a seam), of which anatomists distinguish several varieties; the most important are *serrated*, saw-teeth-like; *squamous*, or scaly; *harmonia*, or apposite; and *schindylesis*, fissure-like.

The most prominent cranial articulations are the *coronal*, *sagittal*, and *lambdoidal* sutures, all of which are serrated. The *coronal* extends transversely across the crown of the skull, uniting the frontal bone with the two parietal. The *sagittal* forms the longitudinal seam along the vertex, and unites with two parietal bones. The *lambdoidal* diverges at an acute angle from the posterior extremity of the sagittal, uniting the occipital and parietal bones. The *squamous* unites the squamous portion of the temporal with the parietal and sphenoid bones. Other sutures are named according to the bones, or parts of bones, which they connect.

Regions.—The skull is divisible into four regions—superior, lateral, inferior, and anterior; or, vertex, side, base, and front. The *superior region* is bounded by the frontal eminences in front, temporal ridges and parietal eminences on each side, and by the upper curved line and protuberance of the occipital behind. The *lateral* is subdivided into *temporal*, *mastoid*, and *zygomatic* portions. The *inferior region* is subdivided into a *cerebral*, or internal, and a *basilar*, or external, surface. The cerebral surface is again subdivided into *anterior*, *middle*, and *posterior fossa*. The face constitutes the *anterior region*.

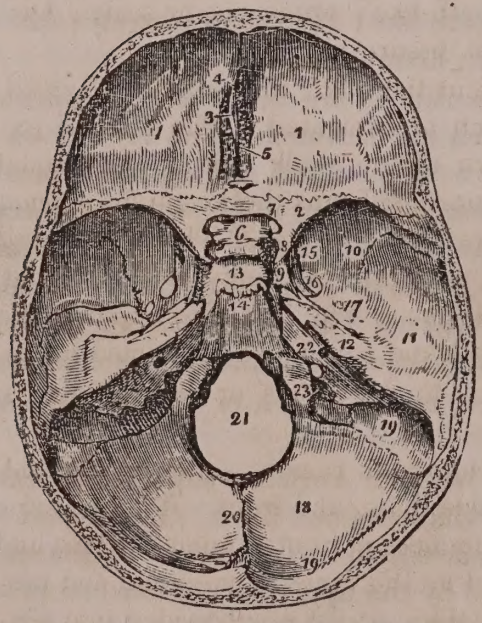
Fig. 8.



FRONT VIEW OF THE SKULL.

Fig. 8 exhibits several minute peculiarities of structure not described in the text. 1. The frontal portion of the frontal bone. 2. Nasal tuberosity. 3. Supra-orbital ridge. 4. Optic foramen. 5. A fissure, called sphenoidal. 6. Another fissure, called spheno-maxillary. 7. The lachrymal fossa. 8. Opening of the anterior nares, the vomer in the centre, on which the figure is placed. 9. Infra-orbital foramen. 10. Malar bone. 11. Symphisis, or point of union of the lower jaw. 12. Mental foramen. 13. Ramus of the lower jaw. 14. Parietal bone. 15. Coronal suture. 16. Temporal bone. 17. Squamous suture. 18. Upper part, or greater wings, of sphenoid bone. 19. Commencement of temporal ridge. 20. Zygoma of temporal bone, forming, with the malar, the zygomatic arch, under which is the zygomatic fossa. 21. The mastoid process.

Fig. 9.



INNER BASE OF THE SKULL.

Fig. 9 represents the cerebral surface of the base of the skull. 1. One side of the anterior fossa. 2. Lesser wing of the sphenoid. 3. Crista galli. 4. Foramen cæcum. 5. Cribriform lamella of the ethmoid. 6. The process called *olivary*. 7. Foramen opticum. 8. Anterior clinoid process. 9. The carotid groove on the side of the sella turcica, for the internal carotid artery and cavernous sinus. 10, 11, 12. Middle fossa of the base of the skull: 10 marks the great ala of the sphenoid; 11, the squamous portion of the temporal bone; 12, the petrous portion. 13. The sella turcica. 14. Basilar portion of sphenoid and occipital bones. The uneven ridge between 13 and 14 is called *dorsum* ephippii, and the prominent angles of the ridge constitute the posterior clinoid processes. 15. Foramen rotundum. 16. Foramen ovale. 17. Foramen spinosum; a small opening between 17 and 12 is called *hiatus Fallopii*. 18. Posterior fossa of the base of the skull. 19, 19. The groove for the lateral sinus. 20. The ridge upon the occipital bone, to which the *falx cerebelli* is attached. 21. Foramen magnum. 22. Meatus auditorius internus. 23. Jugular foramen.

ORBITS OF THE EYE.

These are hollow cones for the lodgment of the eyeballs, with their

muscles, vessels, and nerves, and the lachrymal glands. The *superior* boundary is formed by the orbital plate of the frontal bone, and by part of the lesser wing of the sphenoid; the *inferior* by part of the malar bone, and by the orbital process of the superior maxillary and palate bones; the *internal* by the lachrymal bone, the external surface of the ethmoid, called *os planum*, and part of the body of the sphenoid; and the *external* by the orbital process of the malar bone, and the great ala, or wing of the sphenoid. Communicating with the orbit are *nine* openings for the transmission of arteries, veins, and nerves.

The *Nasal Fossæ* are irregular cavities in the middle of the face, bounded *above* by the nasal bones, ethmoid and sphenoid; *below* by the palate processes of the palate and superior maxillary bones; *outwardly* by the superior maxillary, lachrymal, inferior turbinated, superior and middle turbinated bones of the ethmoid, palate, and internal pterygoid plate of the sphenoid. The partition between them is formed by the vomer and the perpendicular lamella of the ethmoid.

Each nasal cavity is divided into three irregular longitudinal passages, called *meatuses*, by three projecting processes of bone from the outer wall—the superior, middle, and inferior turbinated bones. The inferior or lower meatus is much the largest.

THE TEETH.

The human animal is provided with two sets of teeth: the first are those of childhood, called *deciduous*, or milk teeth. The second are *permanent*. The teeth of childhood are twenty: *eight incisor*, or cutting, *four canine*, and *eight molars*, or grinding teeth.

Fig. 10.

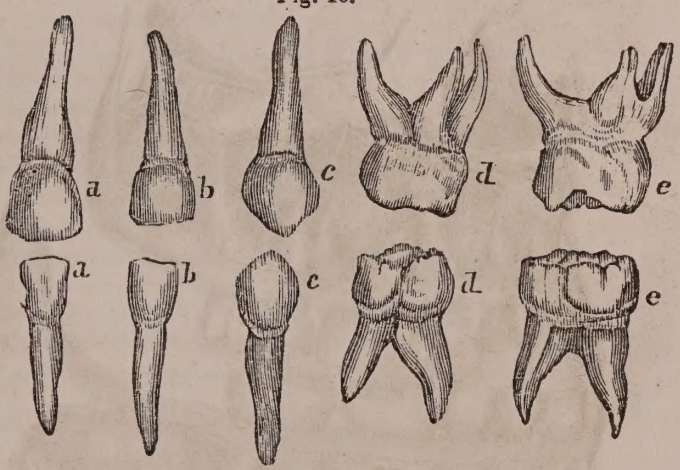
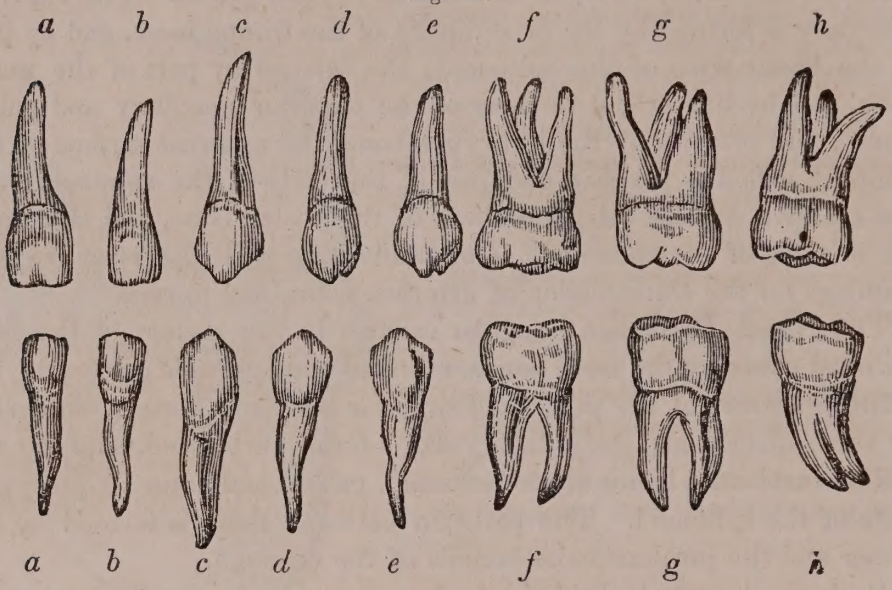


Fig. 10.—*a*. Central incisor. *b*. Lateral incisor. *c*. Canine. *d*. First molar. *e*. Second molar.

TEMPORARY TEETH.

The permanent teeth are thirty-two, sixteen in each jaw. The *eight* central are called *incisors*, or cutting; next are the *four canine*, or eye teeth; then the *eight bicuspids*, or small double; and lastly, *twelve molars*, or grinding. Each lateral half of each jaw, reckoning from the centre, contains two incisors, one canine, two bicuspids, and three molars.

Fig. 11.

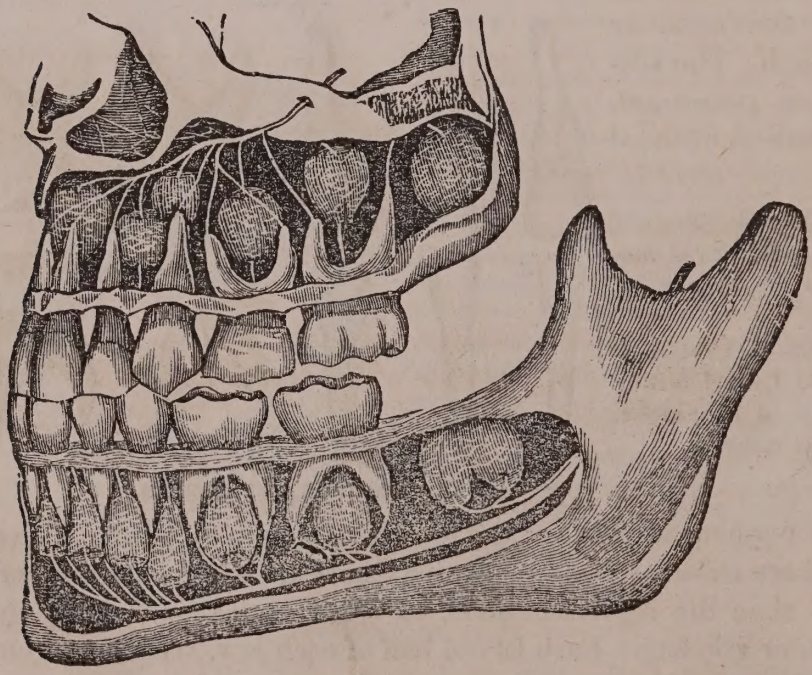


PERMANENT TEETH.

In Fig. 11, *a* is the central incisor. *b*. Latera. incisor. *c*. Cuspid, or canine. *d*. First bicuspid. *e*. Second bicuspid. *f*. First molar. *g*. Second molar. *h*. Third molar.

A tooth is composed of a firm external crust, called *enamel;* the tooth bone proper, called the *ivory;* and a cortical substance, called *cementum*. The enamel covers the exposed surface of the crown, and

Fig. 12.



INFANT TEETH, AND RUDIMENTS OF THE PERMANENT

the cementum forms a thin coating over the root of the tooth. Its structure is similar to bone, and exhibits numerous calcigerous cells and tubuli. The cementum becomes thicker in old age, and gives rise to appearances in old persons called *exostosed*; the same appearances are also produced by mercury and other drugs.

In Fig. 12 are seen the number, arrangement, and nervous connection of a complete set of infant teeth, with the rudiments of the second set, or permanent teeth. The cut represents the jaws of a child at the age of about four years.

Periods of Dentition.—The temporary teeth usually appear in the following order, the lower teeth generally preceding the upper: In the *seventh* month the two middle incisors; in the *ninth* the two lateral incisors; in the *twelfth* the first molares; in the *eighteenth* the canine; and in the *twenty-fourth* the two last molares. This order, however, is subject to considerable irregularity.

The permanent teeth generally appear:

First molares, at 6½ years.	Second bicuspids, 10th year.
Two middle incisors, 7th year.	Canine, 11th to 12th year.
Two lateral incisors, 8th year.	Second molares, 12th to 13th year.
First bicuspids, 9th year.	Last molares, 18th to 21st year.

The last grinding tooth, from its late development, is called *dens sapienta*, or wisdom tooth. Occasionally it does not appear till twenty-five or thirty years of age, or even later.

The *Hyoid*, or tongue bone, called *os hyoides*, is situated at the base of the tongue, supporting it and the upper part of the larynx. It consists of a central body, two processes, which project backward, called the *greater cornua*, and two *lesser cornua*, ascending from its angles.

Fig. 13 is a front view of it. 1. The convex or antero-superior side of the body. 2. Greater cornua of the left side. 3. Lesser cornua.

In early life the cornua and body are connected by cartilages and ligaments which become ossified in old age.

Fig. 13.

OS HYOIDES.

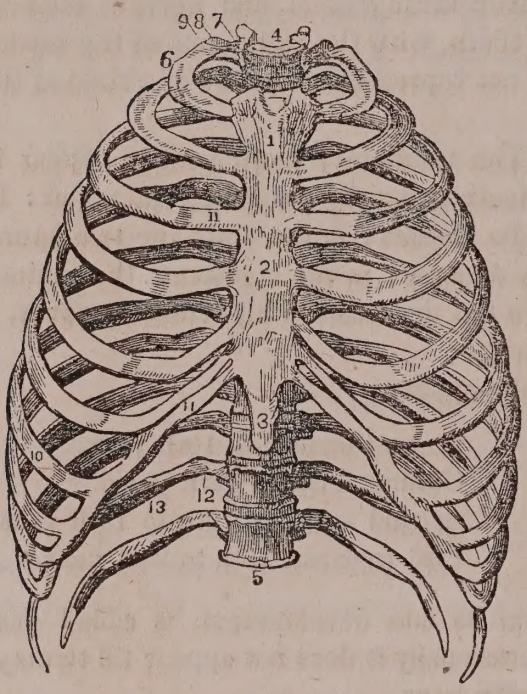
BONES OF THE CHEST.

The sternum, or breast bone, in front, and the twelve pairs of ribs on the sides, constitute the *thorax*.

The *Sternum* is situated in the central line of the front part of the chest; its upper end lies within a few inches of the vertebral column, while its inferior extremity projects considerably forward. Its

upper end is called *manubrium*, to each side of which the clavicle is attached. The middle portion is called the *body*, and the inferior extremity terminates in the *xiphoid*, or *ensiform cartilage*.

Fig. 14.



THE THORAX.

An anterior view of the thorax is represented in Fig. 14. 1. The manubrium. 2. Body. 3. Ensiform cartilage. 4. First dorsal vertebra. 5. Last dorsal vertebra. 6. First rib. 7. Head of first rib. 8. Its neck. 9. Its tubercle. 10. Seventh rib. 11. Costal cartilages of the ribs. 12. Last two false ribs. 13. The groove along the lower border of each rib.

THE RIBS.—The first or upper seven pairs are called *sternal*, or *true* ribs, because they are articulated with the sternum. The five lower pairs are called *false*, or *asternal*, and are connected with each other in front by cartilages.

The ribs increase in length from the first to the eighth, and then diminish to the twelfth. In breadth they diminish from the first to the last, excepting the two lower ones. The first is horizontal, and all the rest oblique, the anterior end falling considerably below the vertebral end. Each rib is curved to correspond with the arch of the thorax, and twisted upon itself. Near the vertebral extremity the rib is bent upon itself, forming an *angle* for the attachment of the tendon of the sacro-lumbalis muscle. Behind this angle is the rough elevation called the *tubercle*. The vertebral end of the rib is expanded into a *head* for articulation with two contiguous vertebræ. The two lower false ribs are much shorter than the others, and are called *floating* ribs.

The sternal ends of the ribs are cartilaginous, thus contributing mainly to the elasticity of the thorax; in old age these *costal cartilages* are more or less ossified. The first seven cartilages articulate with the sternum; the three next with the lower border of that immediately preceding; and the last two lie free between the abdominal muscles. Each rib articulates with two vertebræ posteriorly, and one costal cartilage in front, except the first, tenth, eleventh, and twelfth, which are only articulated with a single vertebra each.

BONES OF THE UPPER EXTREMITIES.

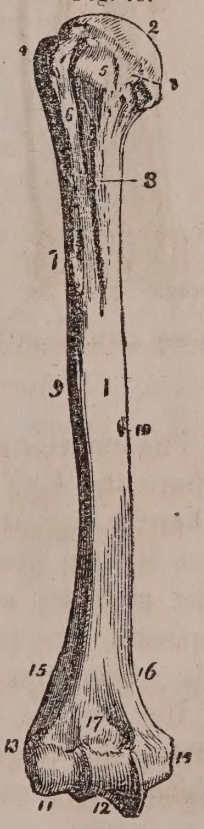
Each upper extremity comprises the clavicle, or collar bone; the scapula, or shoulder blade; the humerus, or arm bone; the ulna and radius, bones of the fore-arm; the bones of the carpus, or wrist; and the metacarpus and phalanges of the fingers.

The *Clavicle*, or collar bone, extends across the upper part of the side of the chest, from the upper end of the sternum to the point of the shoulder, where it is articulated with the scapula. Its position is somewhat oblique, and in shape it resembles the italic letter *f*.

The *Scapula*, or shoulder blade, is a flat, triangular bone, occupying the space from the second to the seventh rib, upon the posterior aspect and side of the thorax. The *anterior surface* is concave, and marked by several oblique ridges. The *posterior surface*, called *dorsum*, is convex, and divided into two unequal portions by a ridge, called the *spine*. The *superior border* is the shortest; one of its terminating extremities is called the *superior angle*, and the other the *coracoid process*. The *anterior angle* is the thickest portion of the bone, and forms its *head*. On this head is a shallow articulating surface called the *glenoid cavity*, which receives the head of the *humerus*. Above and overhanging the glenoid cavity rises a projection called the *acromion*, on the anterior border of which is an oval articular surface for the outer end of the clavicle. A strong, curved prominence rises from the upper part of the neck, called *coracoid process*, which gives attachment to several ligaments and muscles. The position and form of the scapula and clavicle may be seen in Fig. 1.

The *Humerus*, or arm bone, is long, cylindrical, and divisible into a shaft and two extremities. The *upper extremity* is divided into a *head*, which is articulated with the scapula, *neck*, and *greater* and *lesser tuberosity*. The *lower extremity* is divided into two articular surfaces, the external of which is a rounded prominence, called *eminentia capitata*, which articulates with the head of the radius; the internal is concave, and articulates with the ulna.

Fig. 15.



HUMERUS

Fig. 15 is a front view of the right humeral bone. 1. The shaft. 2. Head. 3. Neck. 4. Greater tuberosity. 5. Lesser tuberosity. 6. A groove called bicipital. 7, 8. Bicipital ridges. 9. A rough surface to which the deltoid muscle is attached. 10. A foramen for nutrient vessels. 11. Eminentia capitata. 12. The trochlea. 13. External condyle. 14. Internal condyle. 15, 16. Condyloid ridges. 17. Fossa for receiving the coronoid process of the ulna.

The *Ulna* and *Radius* are the bones of the fore-arm. The *ulna* is a long bone, slender in the middle, and larger at its upper than its lower extremity. The upper end forms principally the articulation of the elbow; the lower end is excluded from the wrist joint by an intervening cartilage. On its upper extremity is a large semilunar concavity, called the *greater sigmoid notch*, for articulation with the humerus; and on its outer side is a *smaller sigmoid notch*, which articulates with the head of the radius. On the posterior side of the greater notch is the *olecranon process*. The lower extremity terminates in a small rounded head, from one side of which projects a process, called *styloid*; on the opposite side of the head is a smooth surface for articulation with the side of the radius.

Fig. 16.

ULNA AND RADIUS.

The *Radius* is the rotatory bone of the fore-arm. Its upper end is small, and its lower large, forming almost the whole of the wrist joint. Its upper extremity presents a rounded head, the side of which articulates with the ulna. The lower end is broad and triangular, having two articular surfaces—one at the side, for the head of the ulna, and the other at its extremity, for connecting with the scaphoid and semilunar bones of the wrist.

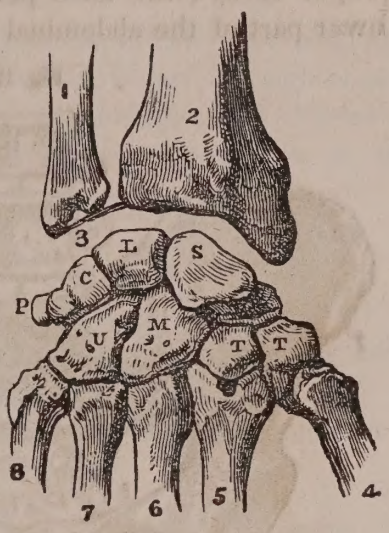
Fig. 16 exhibits the ulna and radius in front. 1. Shaft of the ulna. 2. Greater sigmoid notch. 3. Lesser sigmoid notch. 4. Olecranon process. 5. Coronoid process. 6. Nutritive foramen. 7. Sharp ridges to which the interosseous membrane is attached. 8. Capitulum ulnæ. 9. Styloid process. 10. Shaft of the radius. 11. Its head. 12. Its neck. 13. Its tuberosity. 14. The oblique line. 15. Lower extremity. 16. Its styloid process.

The anterior surface of the radius is somewhat concave superiorly, where the long flexor muscle of the finger is lodged, and flat below where it supports the pronator quadratus muscle. The *nutritive foramen* is seen near the upper third of this surface, directed upward. The posterior surface is round above, where it supports the short supinator muscle, and marked by several shallow, oblique grooves below, where the extensor muscles of the thumb are attached. Most of the tendons of the extensor muscles of the fingers arise from grooves and ridges around the projecting point of its lower extremity, which point is called its *styloid process*.

BONES OF THE WRIST.

These are eight in number, arranged in two rows, which constitute the *carpus*. The first row, counting from the side of the radius, comprises the *scaphoid*, *semilunar*, *cuneiform*, and *pisiform*; the second row, the *trapezium*, *trapezoides*, *magnum*, and *unciform*. Their shape and position are seen in Fig. 17, which represents the outside of the right hand.

Fig. 17



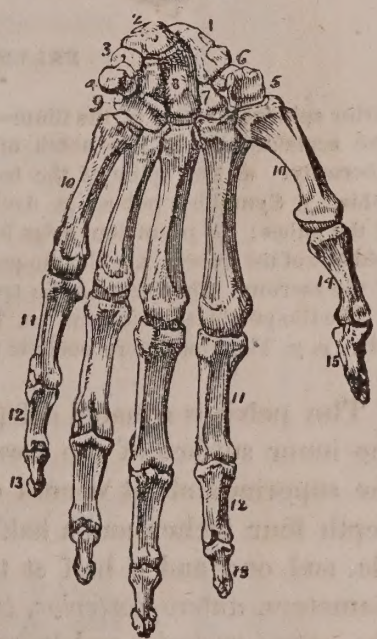
THE CARPUS.

1. Lower end of the radius. 2. Lower end of the ulna. 3. Interarticular cartilages, attached to the styloid process of the ulna, and to the margin of the articular surface of the radius. S. The scaphoid. L. Semilunar. C. Cuneiform. P. Pisiform. T. Trapezium. T. Trapezoides. M. Os magnum. U. Unciform.

BONES OF THE HAND.

These are divisible into the metacarpus and phalanges. The *metacarpus* is composed of the five long bones between the fingers and wrist; that pertaining to the thumb is one third shorter than the others. The *phalanges* are the finger bones; they are fourteen in number, three belonging to each finger, and two to the thumb.

Fig. 18.



METACARPUS AND PHALANGES

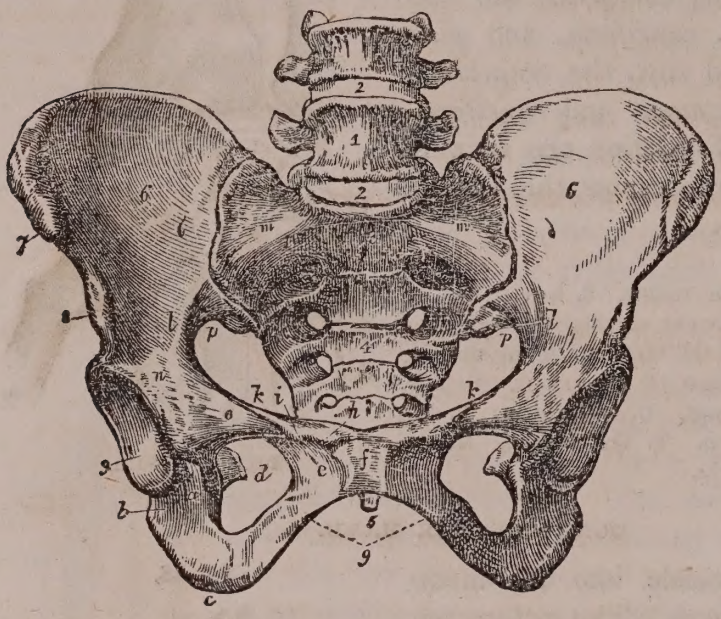
Fig. 18 shows the aspect of the hand anteriorly. 1. The scaphoid bone. 2. Semilunar. 3. Cuneiform. 4. Pisiform. 5. Trapezium. 6. A groove in the trapezium, which lodges the tendon of the flexor carpi radialis. 7. Trapezoides. 8. Os magnum. 9. Unciform. 10, 10. The five metacarpal bones. 11, 11. First row of phalanges. 12, 12. Second row. 13, 13. Third row. 14. First phalanx of the thumb. 15. Second do.

BONES OF THE PELVIS.

The pelvis is composed of the two ossa innominata, which form its sides and front, and the sacrum and coccyx behind. Anatomists divide

it into a *true* and *false* pelvis. The true is the portion beneath a line, called *linea ilio pectinea*, which forms the margin, or brim, of its proper cavity; the false pelvis is the part above, and is in reality the lower part of the abdominal cavity.

Fig. 19.



PELVIS.

Fig. 19 is a front view of a female pelvis, which is broader its cavity more shallow, and the bones lighter than in the male. 1. The last lumbar vertebra. 2, 2. The intervertebral substance connecting the last lumbar vertebra with the fourth and sacrum. 3. Promontory of the sacrum. 4. Anterior surface of the sacrum, on which the transverse lines and foramina are seen. 5. Lower point or tip of the coccyx. 6, 6. The iliac fossæ, forming the lateral boundaries of the false pelvis. 7. Anterior superior spinous process of the ilium—left side. 8. Anterior inferior spinous process. 9. The acetabulum. *a*. The notch of the acetabulum, *b*. Body of the ischium. *c*. Its tuberosity. *d*. The spine of the ischium seen through the obturator foramen. *e*. Os pubis. *f*. Symphisis pubis. *g*. Arch of the pubes. *h*. Angle of the os pubis. *i*. Spine of the pubes; the prominent ridge between *h* and *i* is the crest of the pubes. *k, k*. Pectineal line of the pubes. *l, l*. The ilio-pectineal line; *m, m*, its prolongation to the promontory of the sacrum. The brim of the true pelvis is represented by the line *h, i, k k, l l, m m n*. The ilio-pectineal eminence. *o*. The smooth surface which supports the femoral vessels. *p, p*. The great sacro-ischiatic notch.

The pelvis is situated obliquely in relation to the trunk of the body, the inner surface of the ossa pubis being directed upward to support the superincumbent viscera of the abdomen. Its cavity measures in depth four inches and a half posteriorly, three and a half in the middle, and one and a half at the symphisis pubis. Its inlet has three diameters, *antero-posterior*, *transverse*, and *oblique*. Its outlet has two the *antero-posterior* and *transverse*.

Each *os innominatum* is divided into three portions, which, in the young subject, constitute separate bones; they are called os ilium, os ischium, and os pubis. The *ilium* is the upper expanded portion forming the prominence of the hip, and articulating with the sacrum. The

ischium is the inferior strong part of it on which the body rests in sitting. The *pubis* forms the front of the pelvis, and supports the external genital organs.

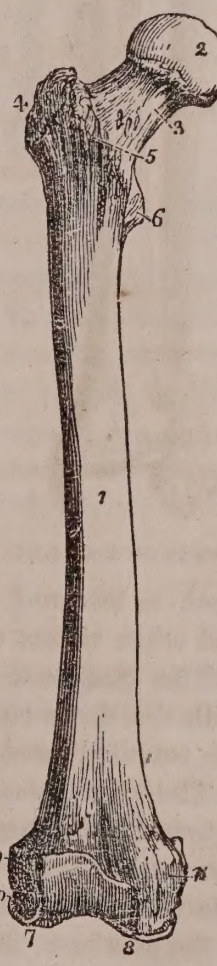
The *acetabulum* is a deep cavity at the junction of the three portions of the innominatum, for receiving the head of the femur, or thigh bone. Between the ischium and pubis is a large oval opening, called *obturator foramen;* it is covered by a ligamentous membrane; a groove in its upper part lodges the obturator vessels and nerves.

BONES OF THE LOWER EXTREMITIES.

These are the femur, patella, tibia and fibula, tarsus, metatarsus, and phalanges.

The *Femur*, or thigh bone, is the longest in the body; it stands obliquely between the hip and knee, this obliquity being greatest in the female, on account of the greater breadth of the pelvis. Its upper extremity is divided into a rounded head, a neck, a large process, called *trochanter major*, situated on the outside, and a smaller projection on the inside, called *trochanter minor*. The lower extremity is broad, and divided into two *condyles*, which articulate with the tibia and fibula.

Fig. 20.



OS FEMORIS

Fig. 20 is the right femur, seen anteriorly. 1. The shaft. 2. Head. 3. Neck. 4. Great trochanter. 5. Anterior intertrochanteric line. 6. Lesser trochanter. 7. External condyle. 8. Internal condyle. 9. The tuberosity to which the external lateral ligament is attached. 10. The fossa for the tendon of the origin of the popliteal muscle. 11. The tuberosity for the internal lateral ligament.

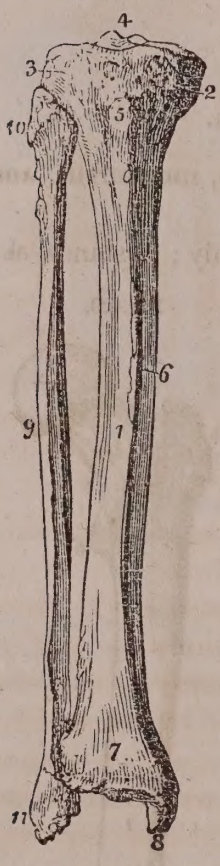
The *Patella*, or knee-pan, is one of the sesamoid bones; it is developed in the tendon of the muscle called quadriceps extensor; its figure is heart-shaped, and it is articulated with the condyles of the femur.

The *Tibia* and *Fibula* are the bones of the leg. The *Tibia* is the inner and largest. Its upper end is expanded into two *tuberosities*, the upper surfaces of which are smooth, for articulation with the femur. On the outer side of the external tuberosity is an articular surface which receives the head of the fibula. A spinous process rises between the artic-

ular surfaces, on each side of which are depressions for the attachment of the *crucial ligament.*

The lower extremity is nearly quadrilateral in shape, and prolonged on its inner side into a process, called *internal malleolus.* On its outer side is an articular surface, which unites it with the fibula. Below is a smooth triangular surface, which articulates with the astragalus.

Fig. 21.



BONES OF THE LEG.

A front view of the tibia and fibula, as articulated with each other, is seen in Fig. 21. 1. The shaft of the tibia. 2. Inner tuberosity. 3. Outer tuberosity. 4. Spinous process. 5. The tubercle. 6. Internal or subcutaneous surface of the shaft. 7. Lower extremity of tibia. 8. Internal malleolus. 9. Shaft of the fibula. 10. Its upper extremity. 11. Its lower extremity, called external malleolus. The sharp border between 1 and 6 is called the crest of the tibia.

The *Fibula* is the outer and smaller bone. Its upper end, or *head*, is large and thick, having a concave surface, which articulates with the external tuberosity of the tibia. The lower end is prolonged beyond the articular surface of the tibia, thus forming the *external malleolus*, the internal surface of which is articulated with the astragalus.

THE TARSUS.—The tarsal bones are seven in number: astragalus, calcaneus, scaphoid, internal, middle, and external cuneiform, and cuboid.

The *Astragalus* has a convex surface above for articulating with the tibia and fibula, and a concave surface below, which articulates with the calcaneus and scaphoid.

The *Calcaneus*, or heel bone, is of an oblong figure, articulated with the astragalus and cuboid Into its lower part the *tendo Achillis*, or strong cord of the heel, is inserted, which is sometimes ruptured in dancing, jumping, and other violent exercises.

The *Scaphoid* is boat-shaped, convex before, where it articulates with the three cuneiform bones, and concave behind, to articulate with the rounded head of the astragalus.

The *Cuneiform* bones are wedge-shaped, whence their name. The *internal* is the largest, and its convex internal surface assists in forming the inner border of the foot. It articulates with the scaphoid, middle cuneiform, and the first two metatarsal bones. The *middle* cuneiform is the smallest; it is connected with the scaphoid, internal and external cuneiform, and second metatarsal. The *external* cuneiform is articu

lated with the scaphoid, middle cuneiform, cuboid and second, third, and fourth metatarsal.

The *Cuboid* is irregularly cuboid in figure, articulating with the calcaneus, external cuneiform, and fourth and fifth metatarsal.

Fig. 22.

BONES OF THE FOOT

The dorsal surface of the left foot is shown in Fig. 22. 1. The astragalus; its superior quadrilateral articular surface. 2. The anterior extremity of the astragalus, which articulates with the scaphoid. 3. Os calcis. 4. Scaphoid. 5. Internal cuneiform. 6. Middle cuneiform. 7. External cuneiform. 8. Cuboid. 9. Metatarsal bones of first and second toes. 10. First phalanx of the great toe. 11. Second do. 12. First phalanx of second toe. 13. Second do. 14. Third do.

THE METATARSUS.—The metatarsal bones are five in number, situated between the toes and the tarsus. The *first*, pertaining to the great toe, is the thickest and shortest; the *second* is the largest; the *third* is smaller; the *fourth* still smaller; and the *fifth* has a large tuberosity on its outer side, in place of an articular surface. They are articulated with the tarsal bones posteriorly, and the first row of phalanges anteriorly.

THE PHALANGES.—The phalanges of the toes correspond with those of the fingers, there being two for the great toe, and three for each of the other toes. The *first* row is convex above, concave beneath, and compressed on the sides. The *second* is short, yet rather broader than the first. The bones of the *third* are called *unequal phalanges*, and, including the second phalanx of the great toe, are flattened and spread laterally at the extremities, to articulate with the second row, and support the toe nails.

SESAMOID BONES.

These are small osseous masses, formed in tendons, which exert a degree of force upon the surface over which they glide. They serve to protect neighboring parts from injurious pressure and friction, by furnishing a sort of pulley for the tendons to play upon. The patella is a sesamoid bone. Besides this, there are four pairs found in different parts of the skeleton, as properly belonging to it—two upon the metacarpo-phalangeal articulation of each thumb, and two upon the corresponding joint of the great toe. Sesamoid bones are frequently found upon the corresponding joints of the little finger and little toe,

also in the tendon of the peroneus longus muscle, where it passes through the groove in the cuboid bone. Sometimes they are found in the tendons around the malleolar processes; in the psoas and iliacus muscles, where they pass over the body of the os pubis, and in the external head of the gastrocnemius. The *bones of the tympanum*, belonging to the auditory apparatus, are sesamoid.

CHAPTER II.

OF THE LIGAMENTS—SYNDESMOLOGY.

THE connection between any two bones constitutes a joint, or articulation. In movable joints the opposing surfaces are coated by an elastic substance, called *cartilage;* this is lubricated by a fluid, called *synovia*, secreted by an enclosing membrane, called *synovial;* while the bones are firmly held together by bands of glistening fibres, called *ligaments*.

The *forms* of articulation are divided into three classes. 1. *Synarthrosis*, or fixed joint, as in the skull, upper jaw, vomer, and teeth. 2. *Diarthrosis*, or movable, the shoulder, hip, elbow, wrist, knee, ankle, carpus, and tarsus. 3. *Amphi-arthrosus*, or intermediate, as in the bodies of the vertebræ.

The *motions* of joints are of four kinds. 1. *Gliding*, the sliding motion of one articular surface upon another. It exists to some extent in all joints, and is the only motion in the carpus and tarsus. 2. *Angular*, which may be forward, called *flexion;* backward, called *extension;* inward, called *adduction;* or outward, called *abduction*. Flexion and extension are illustrated in the knee and elbow, and, more or less, in most other joints; adduction and abduction are seen complete in the shoulder, hip, and thumb. 3. *Circumduction*, which consists in a slight motion of the head of a bone, while the extremity is made to describe a large circle, as in the hip and shoulder. 4. *Rotation*, the movement of a bone on its own axis, as with the radius, the atlas upon the axis, and in the hip and shoulder.

The *structures* in the formation of a joint, in addition to the bone, are cartilage, fibrous tissue, adipose tissue, and synovial membrane.

The *cartilage* of joints serves not only to connect different bones, ut also as a separating medium. It forms a thin coating to the articular surface, and has been classed into *true*, *reticular*, and *fibrous*.

Fibrous tissue about the joints exists in the form of ligament, some-

times constituting bands of various breadth and thickness, and sometimes layers, which extend around the joints; these are called *capsular ligaments*.

Adipose tissue is found in greater or less quantities about joints, where it serves to fill up vacant spaces, and probably increase their elasticity.

Synovial membrane is the smooth, polished lining of a joint which secretes the synovia, and enables opposing surfaces to move upon each other with the most perfect ease and freedom.

Fig. 23.

FIBROUS CARTILAGE.

In Fig. 23 is seen a portion of fibrous cartilage, largely magnified. Its development has already been described; the different kinds of cartilaginous structure are owing to subsequent changes in the cells and intercellular substance.

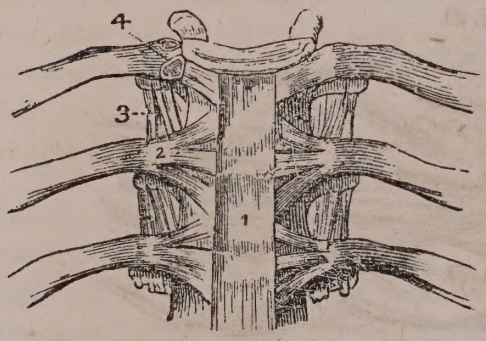
PARTICULAR ARTICULATIONS.

The connecting media of joints are generally named from some prominent circumstance in relation to form, position, points of connection, etc., as *capsular*, surrounding; *transverse*, running across; *occipito-axoid*, attached to and holding together the occipital and axis bones; *lateral*, connecting the sides of articulating bones, etc.; hence, except with the most important ligaments, the name will be a sufficient description

The Vertebral Joints.—The vertebræ are held together by the following ligaments: 1. *Intervertebral substance*, a disc of fibrous cartilage interposed between the bodies of all the vertebræ. This varies in thickness in different parts of the column, which circumstance contributes much to the formation of the vertebral curves. 2. *Anterior common ligament*, a broad, thin band of fibres attached to the bodies of the vertebræ in front, and extending along the whole column from the neck to the sacrum. 3. *Posterior common ligament*, attached to the

bodies behind in a similar manner. 4. *Ligamenta subflava*, two thin plates of yellow fibrous tissue, situated between the arches. 5. *Capsular ligaments*, loose synovial membranes surrounding the articular processes. 6. *Inter-spinous ligaments*, thin membranous bands extended between the spinous processes in the dorsal and lumbar regions. 7. *Supra-spinous ligament*, a strong, inelastic fibrous cord, extending from the apex of the spinous process of the last cervical vertebra to the sacrum, being attached in its course to each spinous process. 8. *Inter-transverse ligaments*, connecting only the transverse processes of the lower dorsal vertebræ.

Fig. 24.



VERTEBRAL LIGAMENTS.

The connection of the anterior ligaments and those of the ribs is seen in Fig. 24. 1. Anterior common ligament. 2. Anterior costo-vertebral ligament. 3. Anterior costo-transverse ligament. 4. Interarticular ligament connecting the head of the rib to the intervertebral substance, and separating the two synovial membranes of this articulation.

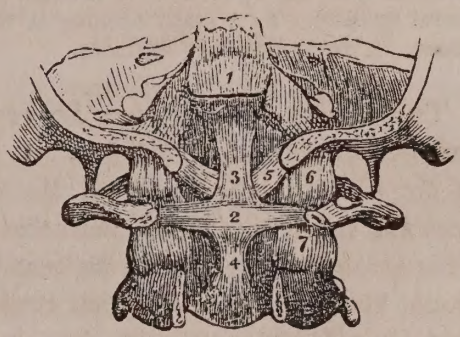
THE NECK JOINT.—There are seven ligaments connecting the atlas with the os occipitis: Two *anterior ligaments*, one of which is a *rounded* cord, attached above to the base of the occipital, and below to the anterior tubercle of the atlas; the other is a *broad* membranous layer, lying deeper, attached to the margin of the occipital foramen above, and to the whole length of the anterior arch of the atlas below; a *posterior ligament*, thin and membranous, attached above to the margin of the occipital foramen, and below to the posterior arch of the atlas; two *lateral ligaments*, strong fascicula of fibres, attached below to the base of the transverse process of the atlas, at each side and above to the transverse process of the occipital bone; two *capsular ligaments*, thin ligamentous capsules surrounding the synovial membranes of the articulation, between the condyles of the occipital bone and the superior articular processes of the atlas. The motions between the cranium and atlas are *flexion* and *extension*.

The axis is articulated with the occipital bone by three ligaments—the *occipito-axoid*, a broad band covering the odontoid process and its ligaments, and two *odontoid*, short, thick fibrous fasciculi, which pass outward from the apex of the odontoid process to the sides of the occipital foramen and condyles. These ligaments are called *check* ligaments, because they limit the rotatory movements of the head.

The atlas is articulated with the axis by five ligaments. The *anterior* consists of ligamentous fibres, passing from the anterior tubercle and arch of the atlas to the base of the odontoid process and body of the axis. The *posterior* is a thin membranous layer, which passes between the posterior arch of the atlas and the laminæ of the axis. The two *capsular* loosely surround the articular processes of the atlas and axis, and permit great freedom of movement. The *transverse* is a strong band, arching across the area of the ring of the atlas, from one articular process to the other. It retains the odontoid process of the axis in connection with the anterior arch of the atlas. Where it crosses the odontoid process, some fibres pass downward to be attached to the body of the axis, and others are sent upward to the basilar process of the occipital bone. This disposition enables the atlas, and with it the whole head, to rotate upon the axis, its extent of rotation being limited by the odontoid ligaments.

Fig. 25 is a posterior view of the ligaments connecting the atlas, axis, and occipital bone. The back part of the occipitis and the arches of the atlas and axis have been removed. 1. The superior part of the occipito-axoid ligament, which has been cut away to show the ligaments beneath. 2. Transverse ligament of the atlas. 3, 4. Ascending and descending slips of the transverse ligament, which have given to it the title of *cruciform*. 5. One of the odontoid ligaments; the other is seen on the opposite side. 6. One of the occipito-atloid capsular ligaments. 7. One of the atlo-axoid capsular ligaments.

Fig. 25.

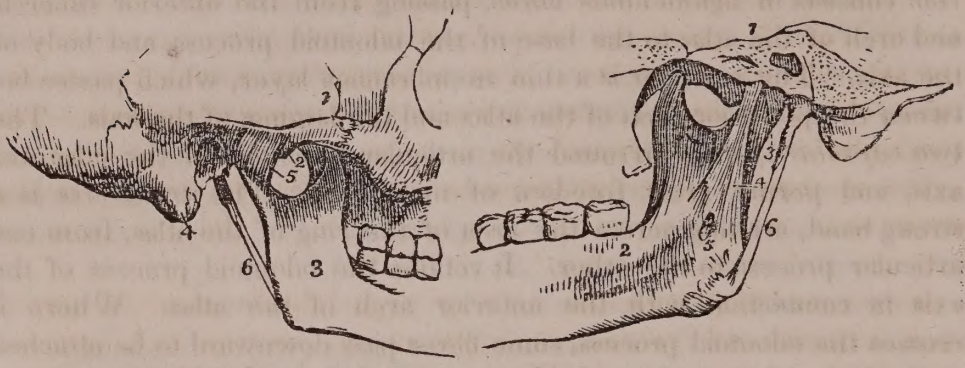


NECK JOINT POSTERIORLY.

Joints of the Lower Jaw.—These are formed by the *external lateral ligaments*, short, thick bands of fibres extending obliquely backward from the zygomas to the external surface of the necks of the lower jaw; the *capsular ligament*, consisting of a few irregular fibres passing from the edges of the glenoid cavities to the necks; the *inter-articular fibrous cartilages*, thin, oval plates, thicker at the edges than in the centre, placed horizontally between the heads of the condyles and the glenoid cavities, thus dividing each joint into an upper and a lower cavity; and the *synovial membranes*, one situated above and one below the cartilages.

The movements of the lower jaw are *depression* and *elevation*, by which the mouth is opened and shut; also a *forward*, *backward*, and *lateral* movement from side to side, constituting the *grinding* motion.

Fig. 26. Fig. 27.



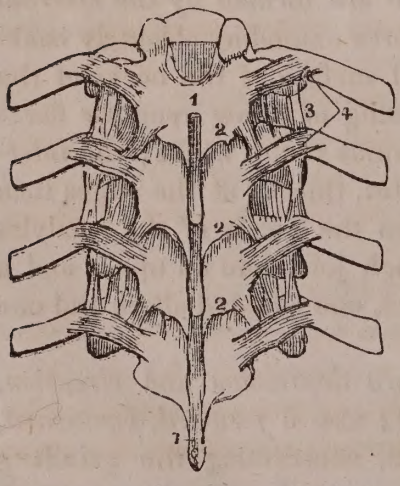
JOINTS OF THE LOWER JAW.

Fig. 26 is an external view of this articulation. 1. The zygomatic arch. 2 Tubercle of the zygoma. 3. Ramus of the lower jaw. 4. Mastoid portion of the temporal bone. 5. External lateral ligament. 6. Stylo-maxillary ligament.

Fig. 27 is an internal view. 1. A section through the petrous portion of the temporal bone, and spinous process of the sphenoid. 2. An internal view of the ramus and part of the body of the lower jaw. 3. Internal portion of the capsular ligament. 4. Internal lateral ligament. 5. A small opening at its insertion, where the milo-hyoidean nerve passes. 6. Stylo-maxillary ligament.

THE COSTO-VERTEBRAL JOINTS.—The ribs have a double articular connection with the vertebra. 1. By ligaments connecting the *head of the rib* with the *bodies of the vertebra*. 2. Those connecting the *neck* and *tubercle of the rib* with the *transverse processes* of the vertebræ. This arrangement renders dislocation impossible, as the neck of the rib would break before dislocation could occur. In addition, most of these costo-vertebral articulations have a *capsular*, *interarticular*, and three *transverse ligaments*, named, from their positions, *anterior*, *middle*, and *posterior costo-transverse ligaments*.

Fig. 28.



COSTO-VERTEBRAL JOINTS.

Fig. 28 is a posterior view of a part of the thoracic portion of the vertebral column, showing the ligaments connecting the vertebræ with each other, and the ribs with the vertebræ. 1, 1. The supra-spinous ligament. 2, 2. Ligamenta subflava, connecting the laminæ. 3. Anterior costo-transverse ligament. 4. Posterior costo-transverse ligaments.

The movements of these articulations are *upward* and *downward*, and slightly *backward* and *forward*, all the movements increasing from the head to the anterior extremity of the rib.

Costo-Sternal Joints.—In front the ribs are articulated with the sternum, and some of them with each other. The ligamentous connections are the *anterior*, *posterior*, *superior*, and *inferior costo-sternal*, and the *synovial membranes*. The *sixth*, *seventh*, *eighth*, and sometimes the *fifth* and *ninth* costal cartilages have a perfect synovial membrane, and articulate with each other.

The motions of these articulations are limited to a slight sliding movement.

Joints of the Sternum.—The pieces of this bone are connected by a thin plate of *interosseous ligament*, and *anterior* and *posterior sternal ligaments*, which contribute very much to its strength, and to the elasticity of the front of the chest.

Vertebro-Pelvic Joint.—The last lumbar vertebra and the sacrum are connected by the same general ligaments as are the vertebræ with each other; in addition to which there are two proper ligaments, called *lumbo-sacral* and *lumbo-iliac*.

Joints of the Pelvis.—There are four articulations of the pelvic bones. 1. *Sacro-iliac*, the connection of which is formed by an *anterior* and *posterior sacro-iliac ligament*. The latter is also called *interosseous;* it is composed of strong fibres passing horizontally between the rough surfaces of the sacro-iliac articulations. 2. *Sacro-ischiatic*, the union of the sacrum and ischium, formed by the *anterior* and *posterior sacro-ischiatic ligaments*. The upper border of the anterior forms part of the boundary of the *great sacro-ischiatic foramen;* and its lower border a part of the *lesser sacro-ischiatic foramen*. The superior border of the posterior forms also a part of the lesser sacro-ischiatic foramen, and its lower border a part of the boundary of the perineum. The two ligaments convert the sacro-ischiatic notches into foramina.

Sacro-Coccygean Joint.—Between the sacrum and coccyx is a soft fibrous cartilage. The bones are held together also by the *anterior* and *posterior sacro-coccygean ligaments*. This articulation admits of a backward motion during parturition.

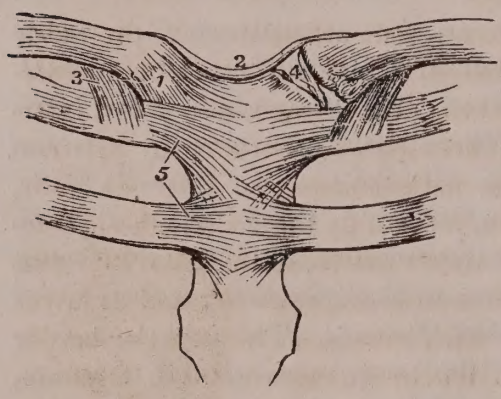
Pubic Joint.—The ossa pubis are connected together by an *interosseous cartilage*, the *anterior*, *posterior*, *superior*, and *sub-pubic ligaments*, which variously cross the symphisis, or place of union. The articulation becomes movable during parturition, and admits of a slight separation of the bones.

The numerous vacuities in the walls of the pelvis, and their closure by ligamentous structures, diminish materially the pressure on the soft parts during the passage of the head of the fœtus.

NOTE.—The *obturator ligament* or *membrane* is a tendo-fibrous expansion stretched across the obturator foramen. It is not concerned in articulation, but gives attachment to the obturator muscles, and leaves a space in the upper part of the foramen for the passage of the obturator vessels and nerves.

STERNO-CLAVICULAR JOINT.—The breast and collar bones are connected by the *anterior*, *posterior*, *sterno-clavicular*, *inter-clavicular*, and *costo-clavicular ligaments*, an *interarticular cartilage*, and two synovial membranes. The motions of this articulation are *gliding* and *circumduction*. This joint is the centre of the movements of the shoulder. In dislocations of the sternal end of the clavicle, the costo-clavicular ligament, called also *rhomboid*, is ruptured, occasioning a peculiar deformity.

Fig. 29.



STERNO-CLAVICULAR JOINT.

Fig. 29 shows the ligaments of the sterno-clavicular and costo-sternal articulations. 1. Anterior sterno-clavicular ligament. 2. Inter-clavicular ligament. 3. Costo-clavicular. 4. Interarticular cartilage. 5. Anterior costo-sternal ligaments of the first and second ribs.

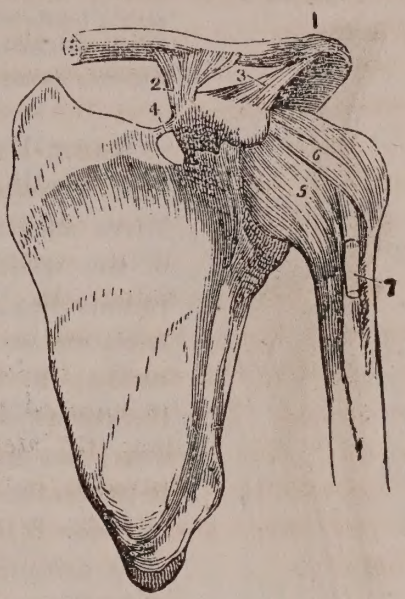
SCAPULO-CLAVICULAR JOINT.—The shoulder blade and breast bone are connected by *two synovial membranes*, an *interarticular cartilage*, a *superior acromio-clavicular*, an *inferior acromio-clavicular*, and a *coraco-clavicular ligament*. This articulation admits of a *gliding* and *rotatory* movement.

NOTE.—The shoulder blade has two ligaments, *coraco-acromial* and *transverse*, which are proper to itself. The first is a thick triangular band, forming a protecting arch over the shoulder joint. The second crosses the notch in its upper border, thus converting it into a foramen.

THE SHOULDER JOINT.—The scapula and humerus form a ball-and-socket articulation; its ligaments are the *capsular*, *coraco-humeral*, and *glenoid*

The ligaments of the scapula and shoulder joint are seen in Fig 30. 1. Superior acromio-clavicular. 2. Coraco-clavicular. 3. Coraco-acromial. 4. Transverse. 5. Capsular. 6. Coraco-humeral. 7. The long tendon of the biceps muscle issuing from the capsular ligament, and entering the bicipital groove.

Fig. 30.



SHOULDER JOINT.

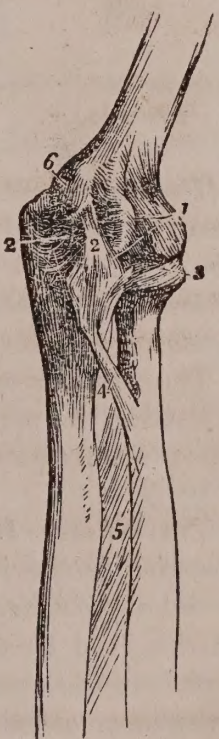
The *capsular ligament* encircles the heads of the scapula and humerus. The *coraco-humeral* is a broad band between the coracoid process of the scapula and the greater tuberosity of the humerus. The *glenoid* is a cartilaginous band around the margin of the glenoid cavity, which it deepens.

The synovial membrane of this joint is very extensive, and the articulation admits of every kind of motion.

THE ELBOW JOINT.—At this articulation the humerus, ulna, and radius are connected by four ligaments in addition to its *synovial membrane*. They are the *anterior*, composed of fibres, which pass vertically, transversely, and obliquely, forming a broad membranous layer, between the anterior surface of the humerus and the coronoid process of the ulna and orbicular ligament; the *posterior*, a broad loose layer between the posterior surface of the humerus and the olecranon; the *internal lateral*, a thick triangular layer passing between the inner condyle of the humerus to the margin of the greater sigmoid cavity of the ulna; and the *external lateral*, a strong narrow band descending from the external condyle of the humerus to the orbicular ligament and ridge of the ulna.

The motions of this articulation are *flexion* and *extension*, the former being limited by the coronoid process, and the latter by the olecranon.

Fig. 31.



ELBOW JOINT INTERNALLY

An internal view of the ligaments is seen in Fig. 31. 1. Anterior. 2. Internal lateral. 3. Orbicular. 4. Oblique. 5. Interosseous. 6. Internal condyle of the humerus, which conceals the posterior ligament.

Fig. 32.

ELBOW JOINT EXTERNALLY.

Fig. 32 is an external view of the elbow articulation. 1. Humerus. 2. Ulna. 3. Radius. 4. External lateral ligament inserted below into the orbicular (5). 6. The posterior extremity of the orbicular, spreading out at its insertion into the ulna. 7. Anterior ligament. 8. Posterior ligament.

RADIO-ULNAR JOINT.—The radius and ulna are held together by an *interarticular cartilage*, the lower surface of which enters into the articulation of the wrist; the *orbicular ligament*, which surrounds the head of the radius, and is attached at each end to the extremities of the lesser sigmoid cavity; the *oblique ligament*, a narrow slip between the coronoid process and the inner side of the radius; the *interosseous ligament*, a broad aponeurosis between the ridges of the radius and ulna; and the *anterior inferior*, and *posterior inferior ligaments*. The orbicular ligament is necessarily ruptured in dislocations of the head of the radius.

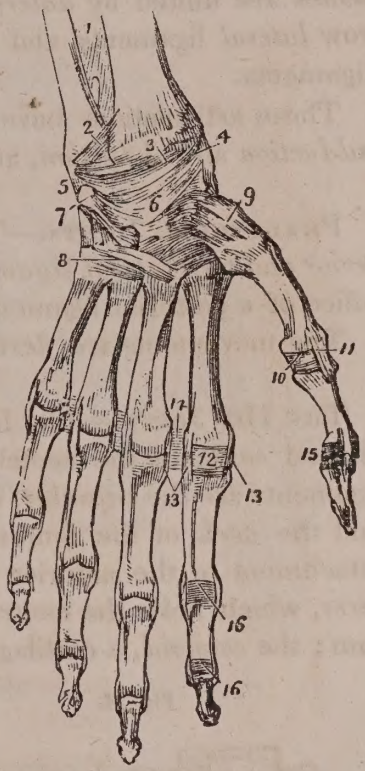
The lower part of the interosseous ligament is perforated for the passage of the anterior interosseous artery. The posterior interosseous artery passes backward between the oblique ligament and the upper border of the interosseous ligament. This ligament affords an extensive surface for the attachment of muscles.

The movements of this joint are, the rotation of the radius upon the ulna; the forward rotation is called *pronation*, and the backward *supination*. The head of the radius also turns upon its own axis within the orbicular ligament and the lesser sigmoid notch of the ulna; and inferiorly a concavity in the radius moves on the rounded head of the ulna.

The anterior and posterior inferior ligaments are chiefly concerned in limiting the movements of the radius, and hence, in great muscular efforts are frequently ruptured.

THE WRIST JOINT.—This articulation is formed by the *anterior*, *posterior*, *internal lateral*, and *external lateral ligaments*, with the *synovial membrane*. Its motions are *flexion*, *extension*, *adduction*, *abduction*, and *circumduction*, in all of which movements the articular surfaces glide upon each other. The wrist joint is an example of the articulation called *ginglymoid*. The radial artery rests on the external lateral ligament as it passes backward to the first metacarpal space.

Fig. 33.



WRIST JOINT

The ligaments of the wrist and hand are seen anteriorly in Fig. 33. 1. Interosseous membrane. 2. Anterior inferior radio-ulnar ligament. 3. Anterior ligament of the wrist. 4. Its external lateral. 5. Its internal lateral. 6. Palmar ligaments of the carpus. 7. Pisiform bone, with its ligaments. 8. Ligaments connecting second range of carpal bones with the metacarpal, and these with each other. 9. Capsular ligament of the carpo-metacarpal articulation of the thumb. 10. Anterior ligament of the metacarpo-phalangeal articulation of the thumb. 11. One of the lateral ligaments of that articulation. 12. Anterior ligament of the metacarpo-phalangeal articulation of the index finger. 13. Lateral ligaments of the same joint; the corresponding ligaments are seen in the other articulations. 14. Transverse ligament connecting the heads of the metacarpal bones of the index and middle fingers; the same ligament is seen between the other fingers. 15. Anterior and one lateral ligament of the phalangeal articulation of the thumb. 16. Anterior and lateral ligaments of the phalangeal articulations of the index finger; the anterior ligaments are removed in the other fingers.

THE CARPAL JOINTS.—The carpal bones are connected by ligamentous bands, which pass transversely and longitudinally from bone to bone on the back, called *dorsal ligaments;* by *palmar ligaments*, which have a similar disposition in front; by *interosseous cartilages* between the bones; and by a strong ligamentous band connecting the bones of the two sides, called *anterior annular ligament.* Five distinct *synovial membranes* enter into the carpal articulations.

Between the bones of each range there is a slight movement of *flexion* and *extension.*

THE CARPO-METACARPAL JOINTS.—The second row of carpal bones articulates with the metacarpal finger bones by *dorsal* and *palmar* ligaments; and the metacarpal of the thumb is joined to the trapezium by a true *capsular ligament.* The metacarpal bones of the four finger are connected at their bases by *dorsal*, *palmar*, and *interosseous* ligaments. The thumb, shoulder, and hip joints are the only ones in the body having *true* capsular ligaments.

The movements of the carpo-metacarpal articulations are limited to a slight degree of *sliding* motion, except in the case of the metacarpal bone of the thumb with the trapezium, which has *flexion*, *extension*, *adduction*, *abduction*, and *circumduction.*

METACARPO-PHALANGEAL JOINTS.—The metacarpal and finger bones are united by *anterior* fibro-cartilaginous ligaments, strong, narrow *lateral* ligaments, and strong ligamentous bands, called *transverse* ligaments.

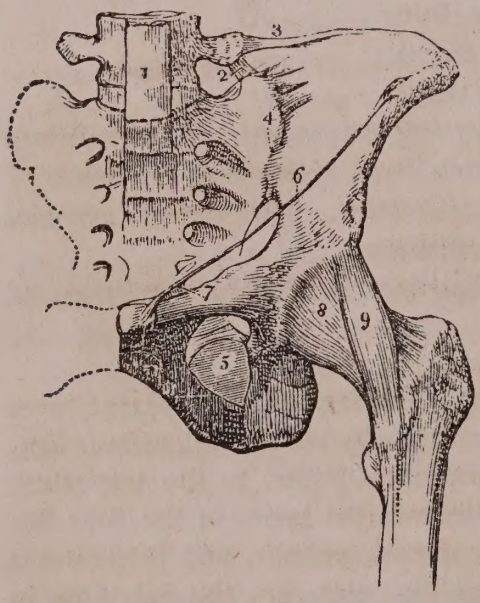
These articulations have the motions of *flexion*, *extension*, a limited *adduction* and *abduction*, and a slight degree of *circumduction*.

PHALANGEAL JOINTS.—The finger bones are connected by an *anterior* and two *lateral ligaments*. The extensor tendon performs the office of a posterior ligament, as with the preceding articulations.

The movements are *flexion* and *extension*.

THE HIP JOINT.—The head of the femur is received into the cup-shaped cavity of the acetabulum, forming a ball-and-socket joint. Its ligaments are the *capsular*, which embraces the acetabulum superiorly, and the neck of the femur inferiorly; the *ilio-femoral*, an accessory attachment to the anterior portion of the capsular; the *ligamentum teres*, which holds the centre of the head of the femur to the acetabulum; the *cotyloid*, a cartilaginous cord around the margin of the acetabulum, which cavity it serves to deepen; the *transverse*, extending across the notch of the acetabulum; and the *synovial membrane*, which invests the head of the femur, and spreads around the ligamentum teres.

Fig. 34.



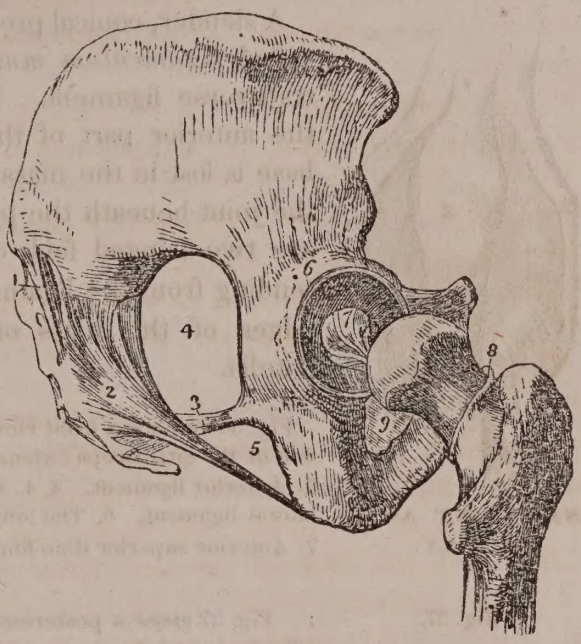
PELVIS AND HIP ANTERIORLY

The hip joint has an extensive range of movements—*flexion*, *extension*, *adduction*, *abduction*, *circumduction*, and *rotation*.

The ligaments of the pelvis and hip joint are partly shown in Fig. 34. 1. Lower part of the anterior common ligament of the vertebræ, extending downward over the front of the sacrum. 2. Lumbo-sacral. 3. Lumbo-iliac. 4. Anterior sacro-iliac. 5. Obturator membrane. 6. Poupart's ligament. 7. Gimbernat's. 8. Capsular. 9. Ilio-femoral, or accessory.

The fossa at the bottom of the acetabulum is filled by an adipose mass, covered by synovial membrane, which serves as an elastic cushion to the head of the bone during its movements.

Fig. 35.



PELVIS AND HIP LATERALLY.

A side view of the ligaments of the pelvis and hip joint is seen in Fig. 35. 1. Oblique sacro-iliac. 2. Posterior sacro-ischiatic. 3. Anterior sacro-ischiatic. 4. Great sacro-ischiatic foramen. 5. Lesser sacro-ischiatic foramen. 6. Cotyloid ligament of the acetabulum. 7. Ligamentum teres. 8. Edge of the capsular. 9. Obturator membrane partly exhibited.

THE KNEE JOINT.—The femur, tibia and fibula, and the patella, are connected at the knee joint by thirteen ligaments; the first-named five are external, and the next five are internal to the articulation, and the remaining three are mere folds of synovial membrane.

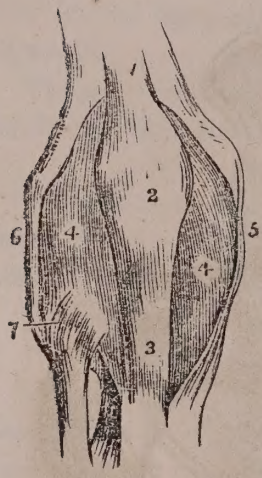
The *anterior*, or *ligamentum patellæ*, is a prolongation of the tendon of the extensor muscles of the thigh downward to the tubercle of the tibia, enclosing the patella; the *posterior* is a broad expansion covering the whole back part of the joint; the *internal lateral* is a broad layer extending between the internal condyle of the femur and the inner tuberosity of the tibia; the *two external lateral* connect the external condyle of the femur to the outer part of the head of the tibia, and the external semilunar cartilage of the articular surfaces with the fibula. Within the joint are the *anterior* and *posterior crucial*, which connect the head of the tibia with the condyles of the femur; the *transverse*, a slip of fibres extending between the semilunar and internal cartilages; the *coronary*, short fibres connecting the borders of the semilunar cartilages to the head of the tibia and surrounding ligaments.

The *semilunar cartilages* are two falciform fibrous plates around the margin of the head of the tibia, serving to deepen the articular surface for the condyles of the femur.

The synovial membrane of this joint is the most extensive in the skeleton, investing the cartilaginous surfaces of the condyles of the femur, of the head of the tibia, and of the inner surface of the patella. Between it and the ligamentum patellæ is a mass of fatty substance,

which presses the membrane toward the interior of the joint, and occupies the fossæ between the condyles.

Fig. 36

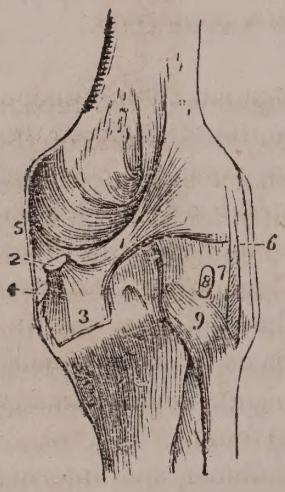


KNEE JOINT ANTERIORLY.

A slender, conical process of synovial membrane, called *ligamentum mucosum*, proceeds from the transverse ligament. Its apex is connected with the anterior part of the condyloid notch, and its base is lost in the mass of fat which projects into the joint beneath the patella. The *alar ligaments* are two fringed folds of synovial membrane, extending from the ligamentum mucosum along the edges of the mass of fat to the sides of the patella.

Fig. 36 exhibits a front view of the ligaments. 1. The tendon of the quadriceps extensor muscle of the leg. 2. Patella. 3. Anterior ligament. 4, 4. Synovial membrane. 5. Internal lateral ligament. 6. The long division of the external lateral 7. Anterior superior tibio-fibular ligament.

Fig. 37.



KNEE JOINT POSTERIORLY.

Fig. 37 gives a posterior view of the ligaments. 1. The fasciculus of the posterior ligament. 2. The tendon of the semi-membranous muscle, from which the posterior ligament is derived. 3. The process of the tendon which spreads out in the fascia of the popliteus muscle. 4. The process which is sent inward beneath the internal lateral ligament. 5. Posterior part of the internal lateral ligament. 6. The long division of the external lateral. 7. Its short division. 8. Tendon of the popliteus cut short. 9. Posterior superior tibio-fibular ligament.

The movements of this joint are *flexion* and *extension*, with a slight degree of *rotation* when the knee is semi-flexed.

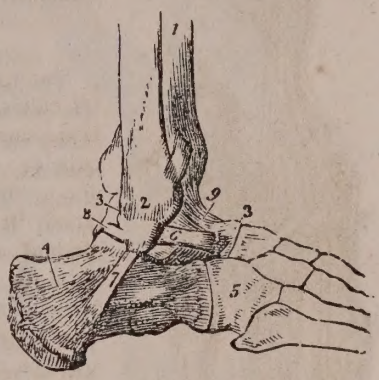
TIBIO-FIBULAR JOINTS.—The bones of the leg are firmly connected together at each extremity by five ligaments: the *interosseous*, *transverse*, *anterior*, and *posterior*, to which is to be added the *synovial membrane*.

The movements between these bones is a very slight degree of yielding or *sliding* motion.

THE ANKLE JOINT.—This is formed by the tibia and fibula with their malleolar processes above, and the astragalus below, connected by three ligaments: the *anterior*, a thin membranous layer; the *internal lateral*, or *deltoid*, a triangular layer of fibres attached above to

the internal malleolus, and below to the astragalus, calcis, and scaphoid; and the *external lateral*, which consists of three separate bundles of fibres, proceeding from the external malleolus, the anterior of which is attached to the astragalus, the *posterior* to the back part of the same bone, and the *middle* to the outer side of the os calcis. The motions of this joint are *flexion* and *extension*.

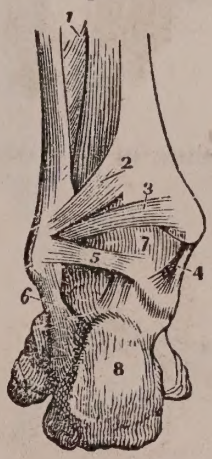
Fig. 38.



ANKLE JOINT EXTERNALLY.

Fig. 38 is an external view of the ankle articulation. 1. Tibia. 2. External malleolus of the fibula. 3, 3. Astragalus. 4. Os calcis. 5. Cuboid. Anterior fasciculus of the external lateral ligament attached to the astragalus. 7. Its middle fasciculus attached to the calcis. 8. Its posterior fasciculus attached to the astragalus. 9. Anterior ligament.

Fig. 39.



ANKLE JOINT POSTERIORLY

Fig. 39 is a posterior view of the ankle joint. 1. Lower part of the interosseous membrane. 2. Posterior inferior ligament connecting the tibia and fibula. 3. Transverse ligament. 4. Internal lateral. 5. Posterior fasciculus of the internal lateral. 6. Middle fasciculus of the external lateral. 7. Synovial membrane. 8. Os calcis.

THE TARSAL JOINTS.—The bones of the tarsus are connected by *dorsal* ligaments, which pass from each bone to all others contiguous: the *plantar*, which connect their under surfaces similarly, and the *interosseous*, of which there are five, situated between adjoining bones. These articulations admit of a slight degree of motion—*forward*, *backward*, and *laterally*; and between the first and second range of bones *adduction* and *abduction*, with slight *flexion* and *extension* take place.

TARSO-METATARSAL JOINTS.—The ligaments connecting the tarsal and metatarsal bones are also *dorsal*, *plantar*, and *interosseous*. The *synovial membranes* are three. The only motion is a slight *yielding* to pressure.

METATARSO-PHALANGEAL JOINTS.—The bones of the metatarsus are connected with those of the toes by ligaments, called *plantar*, *lateral*, and *transverse*, so arranged as to admit of *flexion*, *extension*, *adduction*, and *abduction*. The expansion of the extensor tendon supplies the place of a dorsal ligament.

Fig. 40.

SOLE OF THE FOOT.

THE TOE JOINTS.—The phalanges of the toes have the same ligamentous connection as those of the fingers, and the same variety and extent of motion.

The ligaments of the sole of the foot are seen in Fig. 40. 1. Os calcis. 2. Astragalus. 3. Tuberosity of the scaphoid. 4. Long calcaneo-cuboid ligament. 5. Part of the short calcaneo-cuboid. 6. Calcaneo-scaphoid. 7. Plantar tarsal. 8, 8. Tendon of the peroneus longus muscle. 9, 9. Plantar tarso-metatarsal ligaments. 10. Plantar ligament of the metatarso-phalangeal joint of the great toe; the same ligament is seen upon the other toes. 11. Lateral ligaments of the metatarso-phalangeal joint. 12. Transverse ligament. 13. Lateral ligaments of the phalanges of the great toe; the same ligaments are seen upon the other toes.

NOTE.—In amputations at the tarso-metatarsal joint, it must be understood that the metatarsal bone of the second toe is strongly wedged between the internal and external cuneiform bones, being the most firmly articulated of all the metatarsal bones.

CHAPTER III.

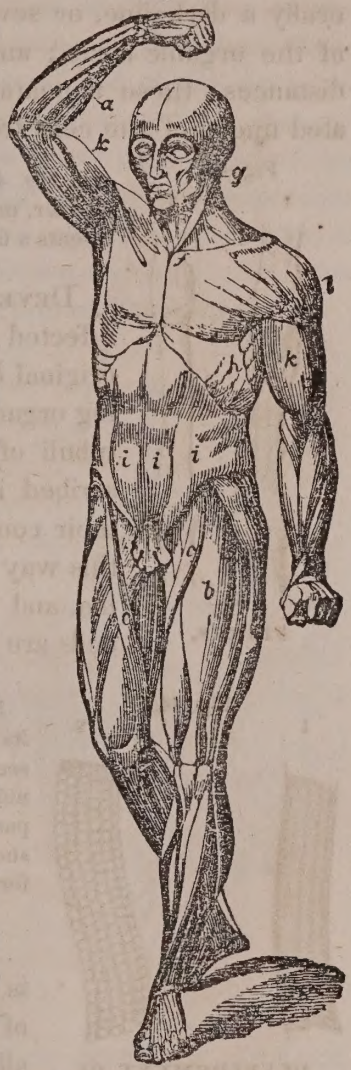
OF THE MUSCLES—MYOLOGY

THE muscles are the moving organs of the body, They are composed of parallel fibres, of a deep red color, constituting *lean flesh*. These fibres are held together by a delicate web of *areolar tissue*, which becomes condensed and so modified toward the extremities of the muscles as to form glistening fibres and cords, called *tendons*, by which they are attached to the surface of the bones.

The greater portion of the bulk of the body is composed of muscular tissue. In the limbs the muscles invest and protect the bones and some of the joints. In the trunk they are spread out to enclose cavities, and form a defensive wall, capable of yielding to external pressure and again returning to its original position. The tendons of broad muscles are often spread out, forming expansions called *aponeuroses*.

The *names* of muscles are generally derived from some prominent character in shape, structure, or use, or points of attachment. The more fixed or central point of attachment is called the *origin* of a muscle, and its movable extremity its *insertion*. Some muscles, however, pull equally at both extremities.

Fig. 41.



MUSCULAR SYSTEM.

Structure of Muscle.—Muscular tissue is composed of bundles of fibres, of variable size, called *fasciculi*, enclosed in a cellular sheath. Each *fasciculus* is composed of smaller bundles, and each bundle of single fibres. These *ultimate fibres*, by microscopic examination, appear to be composed of still smaller fasciculi, called *ultimate fibrils*, enclosed in a delicate sheath, called *myolemma*. Anatomists distinguish two kinds of ultimate muscular fibre: that of voluntary, or animal life, and that of involuntary, or organic life.

The *ultimate fibre of animal life* is distinguished by uniformity of calibre, by its longitudinal striæ, and by transverse markings, which occur at short regular distances. The *ultimate fibrils* are regarded as beaded filaments, consisting of a regular succession of segments and constrictions. An ultimate fibre is composed of a bundle of these fibrils, so disposed that all the segments and all the constrictions correspond, in this manner giving rise to alternate light and dark lines of the transverse striæ.

Fig. 42.

ULTIMATE FIBRE.

Fig. 42 represents an ultimate fibre of animal life, in which the transverse splitting into discs, in the direction of the constrictions of the ultimate fibrils, is seen.

The *ultimate fibre of organic life* is a simple homogeneous filament, flat, without transverse markings, and much smaller than that of animal life. The fibres are collected into fasciculi of various sizes, and held together by dark nuclear fibres. Gen-

erally a dark line, or several dark points, may be seen in the interior of the organic fibres; and sometimes the fibre is enlarged at irregular distances; these appearances are owing to the presence of unobliterated nuclei of the cells from which the fibre was originally developed.

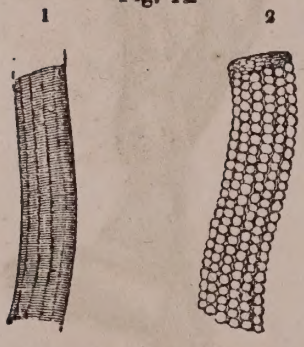
Fig. 43.

FIBRES.

In Fig. 43, 1 exhibits a muscular fibre of organic life from the bladder, magnified 600 times. Four of the nuclei are seen. 2 represents a fibre of organic life from the stomach, equally magnified.

DEVELOPMENT OF MUSCULAR FIBRE.—This is effected by the formation of nucleated cells out of an original *blastema*, or fluid substance capable of becoming organized, and the conversion of the cells into the tubuli of ultimate fibres, by the process already described in relation to the development of bone, while their contents are transformed into ultimate fibrils; in this way the cell membranes constitute the myolemma, and their contents a blastema, out of which new cells are formed.

Fig. 44.



DEVELOPMENT OF MUSCLE.

In Fig. 44, 1 is a muscular fibre of animal life, enclosed in its myolemma. The transverse and longitudinal striæ are seen. 2, 2. Muscular fibres of animal life, more highly magnified than the former. The myolemma is so thin and transparent that the ultimate fibrils can be seen through it. They show the nature of the longitudinal striæ, as well as the formation of the transverse striæ.

The *voluntary system*, or that of *animal life*, is developed from the external or serous layer of the germinal membrane, and comprehends all of the muscles of the limbs and trunk. The *involuntary*, or *organic system*, is formed from the internal or mucous layer, and constitutes the thin muscular structure of the alimentary canal, bladder, and internal organs of generation. At the commencement and termination of the alimentary canal, both classes of fibres are blended in the formation of the muscular coat The heart is developed from the middle or vascular layer of germinal membrane, and is composed of ultimate fibres having the transverse striæ of the muscles of animal life, although its action is involuntary.

MUSCLES OF THE HEAD AND FACE.

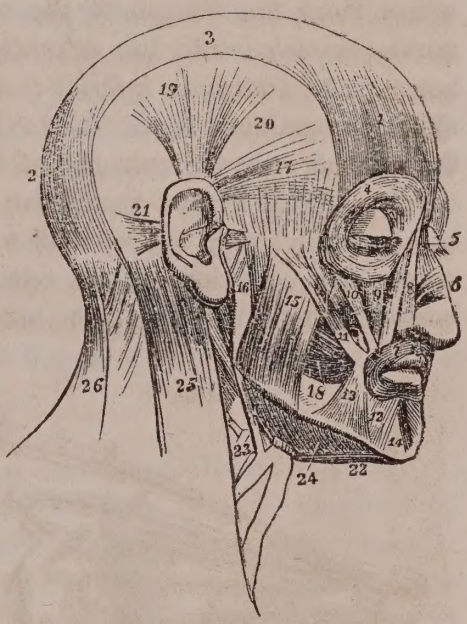
These have been divided into eight groups—cranial, orbital, ocular, nasal, superior labal, inferior labal, maxillary, and auricular.

CRANIAL GROUP.—This has but one muscle, the *occipito-frontalis*

It is a broad expansion, covering the whole side of the vertex of the skull from the occiput to the eyebrow. It *arises* by tendinous fibres from the outer two thirds of the upper curved line of the occipital, and from the mastoid process of the temporal bone. It is *inserted* above the orbit by means of a blending of its fibres with those of the orbicularis palpebrarum, corrugator supercilii, levator labii superioris alæque nasi, and pyramidalis nasi. Its *use* is to raise the eyebrows, in doing which the integuments of the forehead are wrinkled. In some persons the whole scalp moves by the contraction of this muscle.

Fig. 45 shows the muscles of the head and face. 1. Frontal portion of the occipito-frontalis. 2. Its occipital portion. 3. Its aponeurosis, or expansion. 4. Orbicularis palpebrarum, which conceals the corrugator supercilii and tensor tarsi. 5. Pyramidalis nasi. 6. Compressor nasi. 7. Orbicularis oris. 8. Levator labii superioris alæque nasi. 9. Levator labii superioris proprius; the lower part of the levator anguli oris is seen between 10 and 11. 10. Zygomaticus minor. 11. Zygomaticus major. 12. Depressor labii inferioris. 13. Depressor anguli oris. 14. Levator labii inferioris. 15. Superficial portion of the masseter. 16. Its deep portion. 17. Attrahens aurem. 18. The buccinator. 19. Attollens aurem. 20. Temporal fascia covering in the temporal muscle. 21. Retrahens aurem. 22. Anterior belly of the digastricus; its tendon is seen passing through its aponeurotic pulley. 23. Stylo-hyoid, pierced by the posterior belly of the digastricus. 24. Mylo-hyoideus. 25. Upper part of the sterno-mastoid. 26. Upper part of the trapezius. The splenius is seen between 25 and 26.

Fig. 45.



MUSCLES OF THE HEAD AND FACE

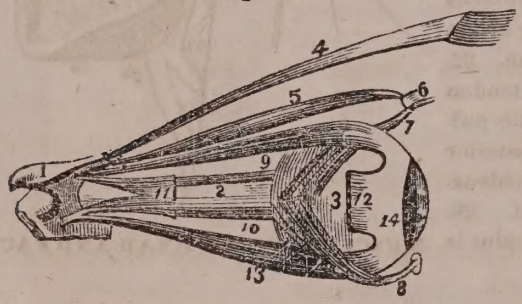
The Orbital Group.—Three muscles: 1. *Orbicularis palpebrarum*, a sphincter or closing muscle, which surounds the orbit and eyelids 2. *Corrugator supercilii*, a narrow, pointed muscle, *arising* from the inner extremity of the superciliary ridge; *inserted* into the orbicularis palpebrarum. 3. *Tensor tarsi*, a very small muscle, *arising* from the orbital surface of the lachrymal bone; *inserted* by two slips into the lachrymal canals. The *use* of this group is to close the lids, draw the eyebrows downward and inward, and extend the lachrymal canals.

The Ocular Group.—This group consists of seven: 1. *Levator palpebræ*, long, thin, and triangular, situated in the upper part of the orbit; *arises* from the upper margin of the optic foramen and sheath

of the optic nerve; *inserted* into the upper border of the upper tarsal cartilage. 2. *Rectus superior*, *arising* with the preceding; *inserted* into the globe of the eye about three lines from the margin of the cornea. 3. *Rectus inferior; arises* from the inferior margin of the optic foramen and sheath of the optic nerve; *inserted* into the inferior surface of the globe near the margin of the cornea. 4. *Rectus internus*, a short, thick muscle; *arises* from the common tendon and the sheath of the optic nerve; *inserted* into the inner surface of the globe near the margin of the cornea. 5. *Rectus externus; arises* from the common tendon, and from the margin of the optic foramen; *inserted* into the outer surface of the globe near the cornea. 6. *Obliquus superior*, *arises* from the margin of the optic foramen and sheath of the optic nerve; *inserted* into the sclerotic coat near the entrance of the optic nerve. 7. *Obliquus inferior; arises* from the inner margin of the superior maxillary bone; *inserted* into the outer and posterior part of the eyeball near the entrance of the optic nerve.

Uses.—The levator raises the upper eyelids; the four recti, when acting singly, pull the eyeball upward, downward, inward, and outward; the superior oblique rolls the globe inward and forward; the inferior oblique rolls the globe outward and backward.

Fig. 46



MUSCLES OF THE EYEBALL.

Fig. 46 is a view of the ocular group, taken from the outer side of the right orbit. 1. A small fragment of the sphenoid bone around the entrance of the optic nerve into the orbit. 2. Optic nerve. 3. Globe of the eye. 4. Levator palpebræ muscle. 5. Superior oblique. 6. Its cartilaginous pulley. 7. Its reflected tendon. 8. Inferior oblique. 9. Superior rectus. 10. Internal rectus, almost concealed by the optic nerve. 11. Parts of the external rectus, showing its two heads of origin. 12. Extremity of the external rectus at its insertion. 13. Inferior rectus. 14. The tunica albuginea, which is formed by the expansion of the tendons of the four recti muscles.

The Nasal Group.—Three muscles: 1. *Pyramidalis nasi*, a slip of fibres extending from the occipito-frontalis downward upon the bridge of the nose; *inserted* into the tendinous expansion of the compressores nasi. 2. *Compressor nasi*, a thin triangular muscle; *arises* from the canine fossa of the superior maxillary bone, and, spreading out on the side of the nose into a tendinous expansion, is continuous across its ridge with its fellow of the opposite side. 3. *Dilitator naris*, a thin muscular slip expanded upon the ala of the nostril.

Uses.—The first draws down the inner ang.e of the eyebrow, and assists the occipito-frontalis; the second *expands* rather than compresses the nostril; the last dilates the cavity of the nostril.

The Superior Labial Group.—Seven muscles constitute this group: 1. *Orbicularis oris*, a sphincter completely surrounding the mouth, the use of which is to close the lips. 2. *Levator labii superioris alæque nasi;* thin, triangular, *arising* from the nasal process; *inserted*, by two distinct portions, into the ala of the nose and upper lip; its *use* is to raise the upper lip, and expand the opening of the nose. 3. *Levator labii superioris proprius;* thin, quadrilateral, *arising* from the lower border of the orbit; *inserted* into the integument of the upper lip; its *use* is to elevate the upper lip. 4. *Levator anguli oris*, *arising* from the canine fossa of the upper jaw, and, passing outwardly, is *inserted* into the angle of the mouth, which it draws inward and upward. 5. *Zygomaticus major*, and *zygomaticus minor;* two slender fasciculi of fibres, *arising* from the malar bone; *inserted* into the angle of the mouth; they pull the angle upward and outward, as in laughing. 7. *Depressor labii superioris alæque nasi*, an oval slip *arising* from the incisive fossa; *inserted* into the upper lip, and into the ala and columna of the nose; it lifts the upper lip, with the ala of the nose, and expands the opening of the nares.

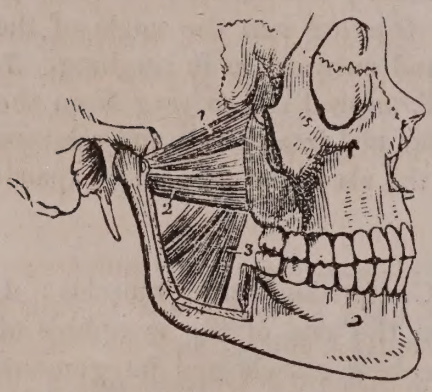
The Inferior Labial Group.—Comprising three muscles: 1. *Depressor labii inferioris; arises* from the side of the symphisis of the lower jaw; *inserted* into the orbicularis muscle and integuments of the lower lip; it draws the under lip directly downward and a little outward. 2. *Depressor anguli oris*, a triangular plane, *arising* from the external oblique side of the lower jaw; *inserted* into the angle of the mouth; it pulls the angle of the mouth either downward and inward, or downward and outward, by the radiation of its fibres, as in the expression of grief. 3. *Levator labii inferioris*, a conical slip, *arising* from the incisive fossa of the lower jaw; *inserted* into the integuments of the chin, which it raises and protrudes.

The Maxillary Group.—Five muscles: 1. *Masseter*, short and thick, composed of two planes of fibres, superficial and deep; the *superficial arises* from the tuberosity of the upper jaw, the lower edge of the malar bone and zygoma, and is *inserted* into the ramus and angle of the lower jaw; the *deep layer arises* from the back part of the zygoma, and is *inserted* into the upper half of the ramus. 2. *Temporalis*, a broad radiating muscle, occupying a considerable extent of the

side of the head, and fitting the temporal fossa; *arises* from the temporal ridge, temporal fascia, and temporal fossa, and converging into a strong, narrow tendon, is *inserted* into the coronoid process. 3. *Buccinator; arises* from the alveolar processes of the upper jaw, and from the external oblique line of the lower jaw; *inserted* into the angle of the mouth, where its converging fibres cross each other. 4. *External pterygoid*, a short, thick muscle, *arising* two-headed from the sphenoid bone; *inserted* into the neck of the lower jaw. 5. *Internal pterygoid*, thick, quadrangular, *arising* from the pterygoid fossa; *inserted* into the ramus and angle of the lower jaw.

Uses.—This group comprises the active agents in mastication. The buccinator circumscribes the cavity of the mouth, and shortens the cavity of the pharynx in deglutition. The masseter, temporal, and internal pterygoid close the jaws, and perform the bruising motions. The two last mentioned, with the external pterygoid, carry the lower jaw forward upon the upper, thus producing the grinding motion. All of these muscles, acting successively, produce a lateral and rotatory movement of the lower jaw.

Fig. 47.



PTERYGOID MUSCLES.

The two pterygoid muscles are seen in Fig. 47. The zygomatic arch and most of the ramus have been removed to bring them into view. 1. The sphenoid origin of the external pterygoid. 2. Its pterygoid origin. 3. Internal pterygoid muscles.

THE AURICULAR GROUP.—Three muscles: 1. *Attollens aurem; 2. Attrahens aurem; 3. Retrahens aurem.* These small muscles of the ear possess ordinarily but little contractility; they raise, extend, and retract the ear in the lower animals.

MUSCLES OF THE NECK.

The muscles of the neck are divided into eight groups, viz.:

THE SUPERFICIAL GROUP.—Two muscles: 1. *Platysma myoides*, *arises* from the integument over the pectoralis major and deltoid muscles; *inserted* into the side of the chin, oblique line of the lower jaw, angle of the mouth, and cellular tissue of the face. It draws the angle of the mouth, depresses the lower jaw, also produces traction on the integuments of the neck. 2. *Sterno-cleido-mastoid* is the large oblique muscle of the neck; *arises* from the sternum and clavicle; *inserted*

into the mastoid process and occipital bone. *Uses.*—When both act together the head is bowed forward; either one acting singly draws the head toward the shoulder, and carries the face toward the opposite side. When the clavicular portions act more forcibly than the sternal they give steadiness to the head, enabling it to support great weights.

The Laryngeal Group.—This group is subdivided into *depressors* and *elevators of the os hyoides and larynx.* The *depressors* are four: 1. *Sterno-hyoideus*, a ribbon-like band *arising* from the back of the upper bone of the sternum and inner extremity of the clavicle; *inserted* into the back of the os hyoides. 2. *Sterno-thyroideus*, a broader band, *arising* from the sternum with the preceding, and from the cartilage of the first rib; *inserted* into the oblique line of the great ala of the thyroid cartilage. 3. *Thyro-hyoideus*, *arises* from the oblique line of the thyroid cartilage; *inserted* into the lower part of the body and great cornua of the hyoid bone. 4. *Omo-hyoideus*, *arises* from the upper border of the scapula and transverse ligament of the supra-scapular notch; *inserted* into the lower border of the body of the hyoid bone.

Uses.—All these muscles pull down the os hyoides and larynx. The first three draw them downward in the middle line; the latter inclines them to one or the other side, according to the position of the head.

The *elevators* are four muscles: 1. *Digastricus*, a two-bellied muscle, *arising* from the inner side of the mastoid process of the temporal bone; *inserted* into the lower jaw near its centre. 2. *Stylo-hyoideus*, a slender muscle, *arising* from the middle of the styloid process; *inserted* into the central part of the body of the os hyoides. 3. *Mylo-hyoideus*, a triangular plane, forming, with its fellow, the floor of the mouth; *arising* from the molar ridge of the lower jaw; *inserted* into the body of the os hyoides, and into the *raphé* of the two muscles. 4. *Genio-hyoideus*, *arising* on the inner side of the centre of the lower jaw; *inserted* into the upper part of the body of the os hyoides.

Uses.—All these muscles raise the os hyoides when the lower jaw is closed, and act upon the lower jaw when the os hyoides is drawn down and fixed by its depressors.

The Linguinal Group.—Five muscles: 1. *Genio-hyo-glossus*; this is the proper muscle of the tongue; *arises*, narrow and pointed, from a tubercle on the inner side of the centre of the lower jaw; *inserted* by a fan-shaped attachment into the whole length of the tongue and body of the os hyoides. 2. *Hyo-glossus*, a square plane, *arising* from the great cornua and body of the os hyoides; *inserted* into the side of

the tongue. 3. *Lingualis*, consisting of a small bundle, running from the base to the apex of the tongue. 4. *Stylo-glossus*, *arising* from the styloid process and stylo-maxillary ligament; *inserted* into the substance and side of the tongue. 5. *Palato-glossus*, constituting, with its fellow, the constrictor of the isthmus of the fauces; is extended between the soft palate and base of the tongue.

Uses.—The various directions of the fibres of the linguinal muscles give the tongue every conceivable variety of motion. The palato-glossi, assisted by the uvula, close the fauces completely in the act of deglutition.

The Pharyngeal Group.—Five muscles: 1. *Constrictor inferior*, *arises* from the upper rings of the trachea, cricoid and thyroid cartilages; *inserted* into the middle of the pharynx. 2. *Constrictor medius*, *arises* from the great cornu of the os hyoides and stylo-hyoidean ligament, and its fibres, radiating from the origin, are *inserted* into the pharynx and basilar process of the occipitis. 3. *Constrictor superior*, *arises* from the molar ridge of the lower jaw, the internal pterygoid plate, and the pterygo-maxillary ligament; *inserted* with the preceding. 4. *Stylo-pharyngeus*, *arising* from the inner side of the base of the styloid process; its fibres spread out beneath the mucous membrane of the pharynx, and are *inserted* into the posterior border of the thyroid cartilage. 5. *Palato-pharyngeus*, *arises* from the soft palate; *inserted* into the inner surface of the pharynx and posterior border of the thyroid cartilage.

Uses.—The constrictors contract upon the food as soon as it passes into the pharynx, and convey it downward to the œsophagus. The stylo-pharyngei draw the pharynx upward and widen it laterally; and the palato-pharyngei draw it upward and assist in closing the opening of the fauces.

Palatal Group.—The muscles of the soft palate are three; their situation is indicated by their names. They are: 1. *Levator palati*, which *raises* the soft palate. 2. *Tensor palati*, which extends the palate laterally, so as to form a septum between the pharynx and posterior nares. 3. *Azygos uvula*, which shortens the uvula.

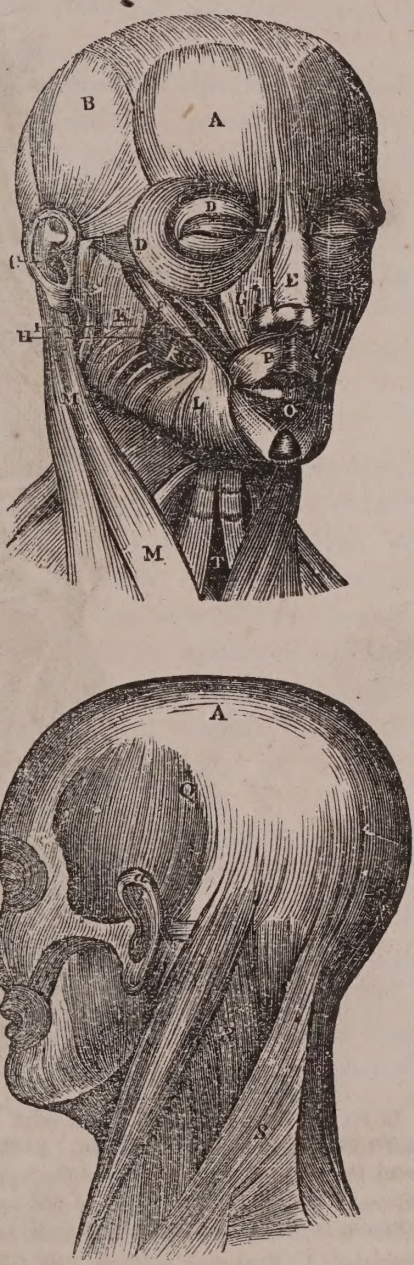
Prævertebral Group.—Five muscles: 1. *Rectus anticus major* *arises* from the anterior tubercles of the transverse processes of the third, fourth, fifth, and sixth cervical vertebræ; *inserted* into the basilar process of the occipitis. 2. *Rectus anticus minor*, *arises* from the side of the atlas; *inserted* with the preceding. 3. *Scalenus anticus*, a tri-

angular muscle, *arising* with the rectus anticus major; *inserted* into the inner border of the first rib. 4. *Scalenus posticus; arises* from the posterior tubercles of all the cervical vertebræ, except the first; *inserted* into the first and second ribs by fleshy fibres. 5. *Longus colli*, a long flat muscle, consisting of two portions, the *upper arising* from the anterior tubercle of the atlas, and *inserted* into the transverse processes of the third, fourth, and fifth cervical vertebræ; and the *lower arising* from the bodies of the second and third, and transverse processes of the fourth and fifth, and passing down the neck, to be *inserted* into the bodies of the three lower cervical and three upper dorsal vertebræ.

Uses.—The rectus major and minor preserve the equilibrium of the head upon the atlas; and when acting with the longus colli, flex and rotate the head and vertebræ of the neck. The scaleni flex the vertebral column, and assist in elevating the ribs in inspiration.

The LARYNGEAL GROUP will be described with the anatomy of the larynx.

Fig. 48



MUSCLES OF THE HEAD AND NECK

In Fig. 48 the most prominent muscles of the head and neck are seen. A. Occipito-frontalis. B. Attollens aurem. C. The concha. D. Orbicularis palpebrarum. E. Compressor naris. F. Zygomaticus major. G. Levator labii superioris alæque nasi. H. Zygomaticus minor. I. Levator anguli oris. K. Masseter. L. Depressor anguli oris. M. Sterno-cleido mastoideus. O. Depressor labii inferioris. P. Orbicularis oris. Q. Temporalis. R. Splenius. S. Trapezius. T. Sterno-hyoideus. *a.* Helix. *b.* Anti-helix. *c.* Concha.

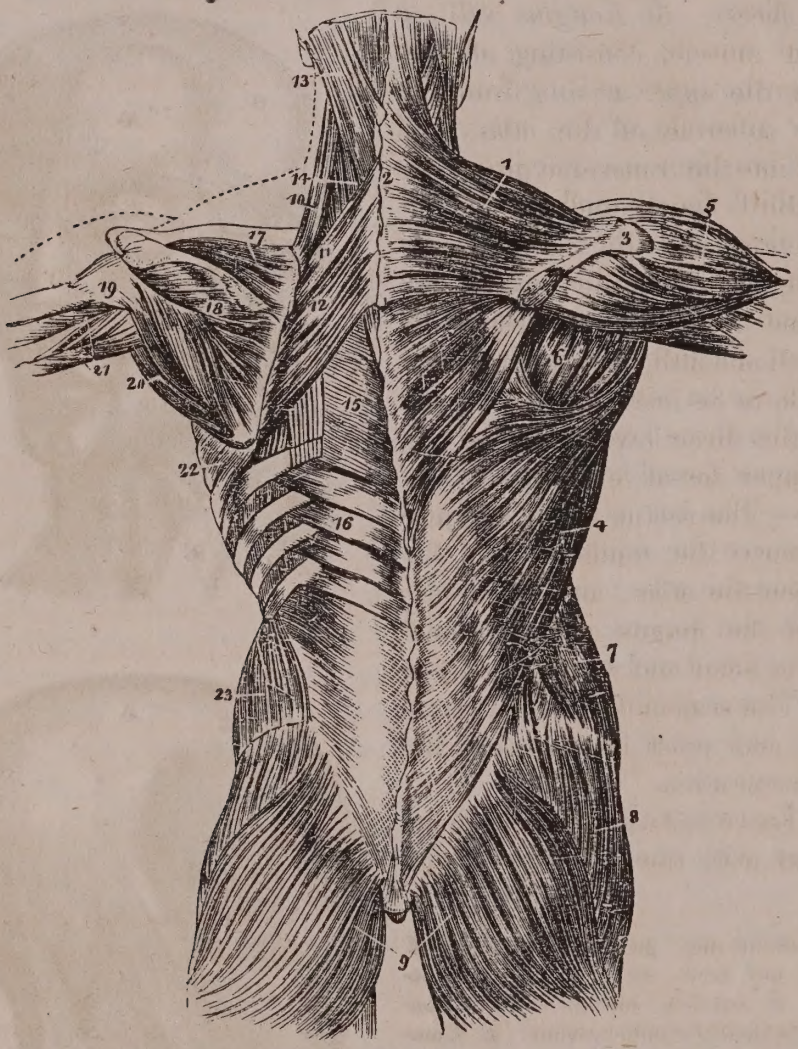
MUSCLES OF THE BACK.

The muscles of the back are divided into six layers.

FIRST LAYER.—Two muscles: 1. *Trapezius; arises* from the upper

curved line of the occipitis, ligament of the neck, and spines of the dorsal vertebræ; *inserted* into the spine and acromion of the scapula, and scapular third of the clavicle. 2. *Latissimus dorsi*, covering the

Fig 49.



EXTERNAL MUSCLES OF THE BACK.

In Fig. 49 the first, second, and part of the third layer are seen; the first on the right, and the second on the left side. 1. Trapezius. 2. The tendinous portion which forms, with the corresponding part of the opposite muscle, the tendinous ellipse on the back of the neck. 3. Acromion process and spine of the scapula. 4. Latissimus dorsi. 5. Deltoid. 6. Infra spinatus, teres minor, and teres major, all muscles of the dorsum of the scapula. 7. External oblique. 8. Gluteus medius. 9. Glutei maximi. 10. Levator anguli scapulæ. 11. Rhomboideus minor. 12. Rhomboideus major. 13. Splenius capitis; the complexus is immediately above, and overlaid by it. 14. Splenius colli; partially seen. 15. Vertebral aponeurosis. 16. Serratus posticus inferior. 17. Supra-spinatus. 18. Infra-spinatus. 19. Teres minor. 20. Teres major. 21. Long head of the triceps, passing between the teres minor and major to the upper arm. 22. Serratus magnus, proceeding forward from its origin at the base of the scapula. 23. Internal oblique.

whole lower part of the back and loins; *arises* from the spines of the seven lower dorsal and all the lumbar vertebræ, sacral spines, back part of the crest of the ilium, and three lower ribs; the fibres converge as they ascend, cross the lower angle of the scapula, curve around the lower border of the teres major, and are *inserted* into the bicipital groove of the humerus.

Uses.—The upper fibres of the trapezius draw the shoulder upward and backward, the middle directly backward, and the lower downward and backward. The latissimus dorsi draws the arm backward and downward, and rotates it inward; if the arm be fixed it will draw the spine to that side, and raise the lower rib, thus aiding inspiration; if both arms be fixed, both muscles will draw the whole trunk forward, as in climbing, walking on crutches, etc.

NOTE.—The *ligamentum nuchæ* is a thin cellulo-fibrous layer between the occipital bone and spine of the seventh cervical vertebræ.

SECOND LAYER.—Three muscles: 1. *Levator anguli scapulæ; arises* from the transverse processes of the four cervical vertebræ; *inserted* into the upper angle and posterior border of the scapula. 2. *Rhomboideus minor; arises* from the spines of the two last cervical vertebræ and ligamentum nuchæ; *inserted* into the posterior border of the scapula. 3. *Rhomboideus minor; arises* from the spines of the last cervical and four upper dorsal vertebræ; *inserted* with the preceding.

Uses.—The levator lifts the upper angle of the scapula, and with the rhomboidei carry the shoulder upward and backward.

THIRD LAYER.—These muscles all arise from the spines of the vertebral column, and pass outwardly. There are three of them: 1. *Serratus posticus superior; arises* from the spines of the lower cervical and upper dorsal vertebræ; *inserted* into the upper borders of the upper ribs. 2. *Serratus posticus inferior; arises* from the spines of the two last dorsal and three upper lumbar vertebræ; *inserted* into the lower borders of the four lower ribs. 3. The *splenius muscle*, *arising* from the lower part of the ligamentum nuchæ, and spines of the four lower cervical and six upper dorsal vertebræ; *inserted* by two divisions, the first, called *splenius capitis*, into the occipital bone, and the second, called *splenius colli*, into the transverse processes of the upper cervical vertebræ.

Uses.—The serrati are muscles of respiration; their actions antagonize, the posterior drawing the ribs upward to expand the chest, and the inferior drawing down the lower ribs, and diminishing the cavity of the chest, thus rendering the first an *inspiratory*, and the second an

expiratory muscle. The splenii of one side draw the vertebral column backward and to one side, and rotate the head toward the corresponding shoulder. The splenii of both sides acting together draw the head forward; they antagonize the sterno-mastoid muscles.

Fourth Layer.—Seven muscles: 1. *Sacro-lumbalis; arises* from the back part of the crest of the ilium, posterior surface of the sacrum and lumbar vertebræ; *inserted* by separate tendons into the angles of the six lower ribs. 2. *Longissimus dorsi; arises* with the preceding; *inserted* into all the ribs between their tubercles and angles. 3. *Spinalis dorsi; arises* from the spines of the two upper lumbar and three lower dorsal vertebræ; *inserted* into the spines of all the upper dorsal vertebræ. 4. *Cervicalis ascendens; arises* from the angles of the four upper ribs; *inserted* into the transverse processes of the four lower cervical vertebræ. 5. *Transversalis colli; arises* from the transverse processes of the four upper dorsal vertebræ; *inserted* into the like processes of the five middle cervical. 6. *Trachleo-mastoid; arises* from the transverse processes of the four upper dorsal and five lower cervical vertebræ; *inserted* into the mastoid process. 7. *Complexus*, a large muscle, forming, with the splenius, the great bulk of the back of the neck; *arises* from the transverse processes of the four upper dorsal, and transverse and articular processes of the five lower cervical vertebræ; *inserted* into the occipital bone, near its spine.

Uses.—These muscles hold the vertebral column erect, and assist in steadying the head; the complexus contracts the muscles on the anterior side of the neck; when the muscles of one side act alone, they produce a rotation of the head.

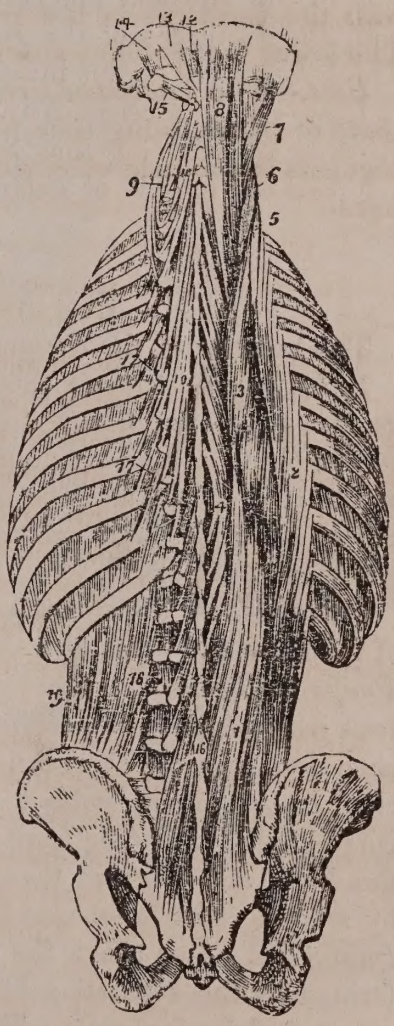
Fifth Layer.—Seven muscles: 1. *Semi-spinalis dorsi; arises* from the transverse processes of the six lower dorsal, and is *inserted* into the spines of the four upper dorsal vertebræ. 2. *Semi-spinalis colli; arises* from the transverse processes of the four upper dorsal, and is *inserted* into the spines of the five upper cervical vertebræ. 3. *Rectus posticus major; arises* from the spines of the axis; *inserted* into the lower curved line of the occipitis. 4. *Rectus posticus minor; arises* from the spinous tubercle of the atlas; *inserted* into the occipitis, below the former. 5 *Rectus lateralis; arises* from the transverse process of the atlas; *inserted* into the occipitis, external to the condyle. 6. *Obliquus inferior; arises* from the spine of the axis; *inserted* into the extremity of the transverse process of the atlas. 7. *Obliquus superior; arises* where the preceding is inserted; *inserted* into the occipitis, between the curved lines.

Uses.—The semi-spinales contribute to the support of the back in the erect position; the recti produce the antero-posterior, and the obliqui the rotatory movement of the atlas on the axis.

Sixth Layer.—Five muscles: 1. *Multifidus spinæ*, consisting of bundles of fibres, *arising* from the transverse processes of all the vertebræ from the sacrum to the axis; *inserted* into the spines of the first or second vertebræ above their origin. 2. *Levatores costarum*, consisting of twelve distinct fasciculi on each side, which *arise* from the transverse processes of the dorsal vertebræ, and are *inserted* into the ribs below, between the tubercles and angles. 3. *Supra-spinalis*, composed of fasciculi *arising* from the lower cervical and upper dorsal vertebræ; *inserted* into the spine of the axis. 4. *Interspinales*, small slips arranged in pairs, situated between the spines of all the vertebræ. 5. *Intertransversales*, small quadrilateral slips between the transverse processes of all the vertebræ.

Uses.—The levators raise the posterior parts of the ribs in inspiration; the others are auxiliaries to the larger muscles in supporting the body, and holding the bones in position.

Fig. 50.



INNER MUSCLES OF THE BACK

In Fig. 50 are seen the fourth and fifth, and part of the sixth layer. 1. Origin of the sacro-lumbalis and longissimus dorsi. 2. Sacro-lumbalis. 3. Longissimus dorsi. 4. Spinalis dorsi. 5. Cervicalis ascendens. 6. Transversalis colli. 7. Trachleo-mastoideus. 8. Complexus. 9. Transversalis colli. 10. Semi-spinalis dorsi. 11. Semi-spinalis colli. 12. Rectus posticus minor. 13. Rectus posticus major. 14. Obliquus superior. 15. Obliquus inferior. 16. Multifidus spinæ. 17. Levatores costarum. 18. Intertransversales. 19. Quadratus lumborum.

MUSCLES OF THE THORAX.

The principal muscles of the thorax belong also to the upper extremity. Those proper to the thorax are three:

1. *External intercostals* 2. *Internal intercostals.* 3 *Triangularis sterni.*

The intercostals are eleven internal and eleven external planes of muscular and tendinous fibres, situated obliquely between the adjacent ribs, and filling the intercostal spaces. The fibres of the external are directed obliquely downward and inward, and those of the internal obliquely downward and backward, so that they cross each other.

The *triangularis sterni* is situated within the chest, connecting the side of the sternum and sternal extremities of the costal cartilages with the cartilages of the second, third, fourth, fifth, and sixth ribs. The lower fibres of this muscle are continuous with the diaphragm.

Uses.—The intercostals raise or depress the ribs, as they act from above or below, being thus both inspiratory and expiratory. The triangularis is a muscle of expiration, by drawing down the costal cartilages.

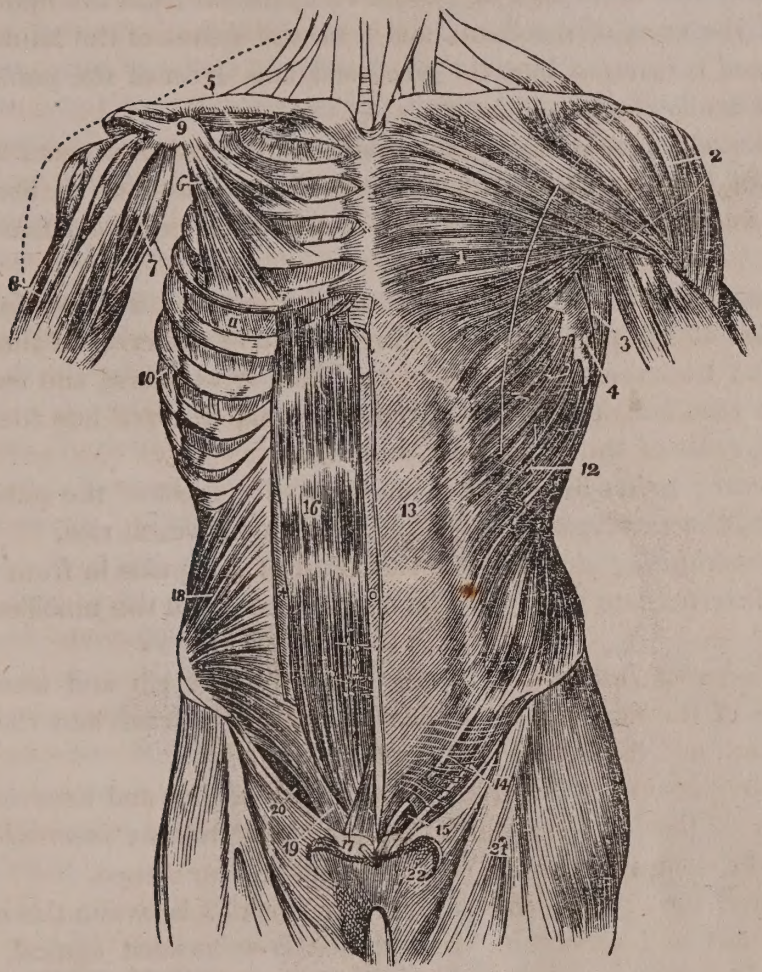
MUSCLES OF THE ABDOMEN.

The muscles of the abominal region are nine in number:

1. *Obliquus externus;* this is the external, flat, *descending* muscle; its fibres *arise* by fleshy digitations from the eight lower ribs, and spread out to a broad aponeurosis, which is *inserted* into the outer part of the crest of the ilium for one half its length, into the anterior superior spine of the ilium, spine of the pubis, pectineal line, front of the pubis, and linea alba.

NOTE.—The lower border of the aponeurosis, between the spines of the ilium and pubis, is rounded from being folded inward, and forms *Poupart's ligament. Gimbernat's ligament* is that part of the aponeurosis inserted into the pectineal line. The *linea alba* is a white tendinous slip extending along the middle of the abdomen from the ensiform cartilage to the os pubis. Externally, on each side of it, are two curved lines, extending from the sides of the chest to the pubis, called the *lineæ semilunares;* these lines are connected with the linea alba by several cross lines, usually three or four in number, called *lineæ transversæ.* Just above the crest of the pubis is a triangular opening, formed by the separation of the fibres of the aponeurosis, called the *external abdominal ring.* Through this ring passes the spermatic cord in the male, and the round ligament of the uterus in the female; both are invested in their passage by a thin fascia derived from the edges of the ring, called *intercolumnar*, or *spermatic fascia.* In inguinal hernia the pouch, in projecting through this opening receives an additional covering from this spermatic fascia.

Fig. 51.



MUSCLES OF THE TRUNK.

In Fig. 51 are seen the muscles of the trunk anteriorly. The superficial layer is seen on the left side, and the deeper on the right. 1. Pectoralis major. 2. Deltoid. 3. Anterior border of the latissimus dorsi. 4. Serrations of the serratus magnus. 5. Subclavius of the right side. 6. Pectoralis minor. 7. Coracho-brachialis. 8. Upper part of the biceps, showing its two heads. 9. Coracoid process of the scapula. 10. Serratus magnus of the right side. 11. External intercostal. 12. External oblique. 13. Its aponeurosis; the median line to the right of this number is the linea alba; the flexuous line to the left is the linea semilunaris; the transverse lines above and below the number are the lineæ transversæ. 14. Poupart's ligament. 15. External abdominal ring; the margin above is called the *superior* or *internal* pillar; the margin below the *inferior* or *external* pillar; the curved intercolumnar fibres are seen proceeding upward from Poupart's ligament to strengthen the ring. The numbers 14 and 15 are situated upon the fascia lata of the thigh: the opening to the right of 15 is called *saphenous*. 16. Rectus of the right side. 17. Pyramidalis. 18. Internal oblique. 19. The common tendon of the internal oblique and transversalis descending behind Poupart's ligament to the pectineal line. 20. The arch formed between the lower curved border of the internal oblique and Poupart's ligament, beneath which the spermatic cord passes, and hernia occurs.

2. *Internal oblique;* called the middle *ascending* flat muscle. It *arises* from the outer half of Poupart's ligament, from the middle two thirds of the crest of the ilium, and from the spines of the lumbar vertebræ; and is *inserted* into the pectineal line, crest of the pubis, linea alba, and five lower ribs.

3. *Cremaster; arises* from the middle of Poupart's ligament; it forms a series of loops upon the spermatic cord, and some of its fibres are *inserted* into the tunica vaginalis, the rest into the pectineal line of the pubis.

4. *Transversalis;* this is the internal flat muscle; it *arises* from the outer third of Poupart's ligament, internal lip of the crest of the ilium, spines and transverse processes of the lumbar vertebræ, and from the six lower ribs, indigitating with the diaphragm; *inserted* into the pectineal line, crest of the pubis, and linea alba.

5. *Rectus; arises* by a flat tendon from the crest of the pubis; *inserted* into the cartilages of the fifth, sixth, and seventh ribs.

6. *Pyramidalis; arises* from the crest of the pubis in front of the rectus; *inserted* into the linea alba midway between the umbilicus and pubis.

7. *Quadratus lumborum; arises* from the last rib and transverse processes of the four upper lumbar vertebræ; *inserted* into the crest of the ilium and ilio-lumbar ligament.

8. *Psoas parvus; arises* from the tendinous arches and intervertebral substance of the last dorsal and first lumbar vertebræ; *inserted* by an expanded tendon into the ilio-pectineal line and eminence.

9. *Diaphragm;* this forms a muscular partition between the cavities of the chest and abdomen. In shape it is somewhat conical, and is composed of two portions, called *greater* and *lesser muscles.* The *greater muscle arises* from the ensiform cartilage, inner surfaces of the six inferior ribs, and ligamentum arcuatum externum and internum; from these points its fibres converge to the central tendon, into which they are *inserted.* The *lesser muscle arises* by two tendons from the bodies of the lumbar vertebræ; these tendons form two large fleshy bellies, called *crura,* which ascend and are *inserted* into the centra tendon.

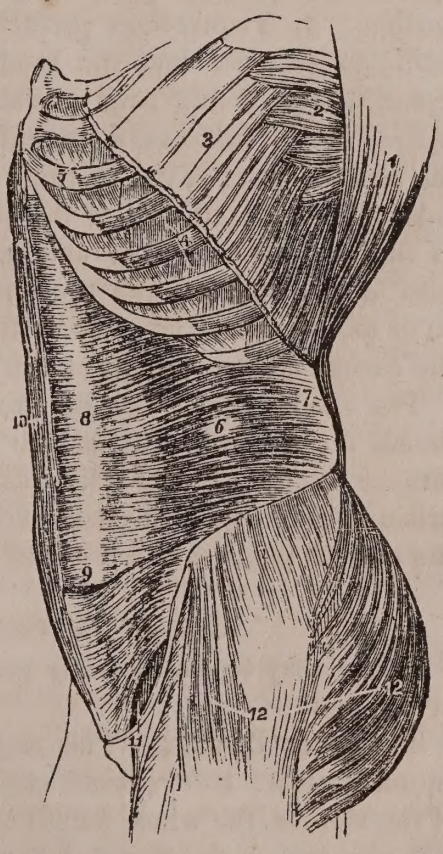
NOTE.—The *ligamentum arcuatum externum* is the upper border of the anterior lamella of the aponeurosis of the transversalis. The *ligamentum arcuatum internum,* or *proprium,* is a tendinous arch across the psoas magnus muscle as it emerges from the chest. The *tendinous centre* of the diaphragm is called the *central tendon.* Between the sides of the ensiform cartilage and the cartilages of the adjoining ribs is a triangular space where the muscular fibres of the diaphragm are

wanting; this space is closed by the peritoneum on the abdominal side, and the pleura on the side of the chest. Sometimes, from violent exertion, a portion of the alimentary canal is forced through this space, producing what is called phrenic or diaphragmatic hernia.

There are three *openings* in the diaphragm: one in the centre, for the passage of the *inferior vena cava;* an elliptic opening in its muscular portion, formed by the two crura, for the passage of the *æsophagus* and *pneumogastric nerves;* and a third, called the *aortic*, formed by a tendinous arch which passes from the tendon of one crus to that of the other; beneath this the *aorta*, *thoracic duct*, and *right vena azygos* pass. There are also small openings in the lesser muscle on each side for the great splanchnic nerves.

Uses.—The oblique muscles flex the thorax on the pelvis; either, acting singly, would twist the body to the opposite side. Either transversalis will diminish the size of the abdomen, and both constrict its general cavity. The recti and pyramidalis together pull the thorax forward; the latter alone are tensors of the linea alba. The quadratus lumborum draws the lower rib downward, and serves to bend the vertebral column to one side. The psoas parvus extends the iliac fascia, and assists in flexing the back. The diaphragm assists the abdominal muscle in expiration.

Fig. 52.



MUSCLES OF THE TRUNK LATERALLY.

Fig. 52 is a side view of the muscles of the trunk. 1. Costal region of the latissimus dorsi. 2. Serratus magnus. 3. Upper part of external oblique. 4. Two external intercostals. 5. Two internal intercostals. 6. Transversalis. 7. Its posterior aponeurosis. 8. Its anterior. 9. Lower part of the left rectus. 10. Right rectus. 11. The arched opening where the spermatic cord passes and hernia takes place. 12. The gluteus maximus, and medius, and tensor vaginæ femoris muscles invested by fascia lata.

All the abdominal muscles are respiratory, and constitute the chief forces in the act of expiration. Considering the lungs as a bellows, they constitute the handles; they are aided in this office by the muscles of the loins and back, and to some extent by the upper muscles of the trunk.

They compress the cavity of the abdomen in all directions, thus aiding the expulsion of the contents of the stomach, bowels, gall-ducts, bladder, and uterus, and also mucous and irritating substances from the bronchia, windpipe, and nose.

MUSCLES OF THE PERINEUM.

These muscles pertain to the urethra, the outlet of the bowels, and the organs of generation. There are eight of them. In the male are: 1. *Accelerator urinæ; arises* from the centre of the perineum; its fibres, dividing, are *inserted* into the ramus of the pubes and ischium, and into the fibrous substance and spongy body of the penis. 2. *Erector penis, arises* from the ramus and tuberosity of the ischium, and, curving around the root of the penis, is *inserted* into the upper surface of its corpus cavernosum. 3. *Compressor urethræ; arises* from the ramus of the ischium, and inner surface of the arch of the pubes on each side of the symphisis; *inserted* into the back part of the urethra, from the apex of the prostate gland to which they are attached, to its bulbous portion. 4. *Transversus perinei; arises* from the tuberosity of the ischium; *inserted* into the tendinous centre of the perineum. 5. *Sphincter ani*, a thin band surrounding the opening of the anus. 6. *Sphincter ani internus*, a muscular ring formed by an aggregation of the circular fibres of the rectum. 7. *Levator ani*, a thin plane of muscular fibres on each side of the pelvis, between the os pubis and spine of the ischium; *inserted* into the lower part of the coccyx, rectum, base of the bladder, and prostate gland. 8. *Coccygeus*, a triangular layer *arising* from the spine of the ischium; *inserted* into the side of the coccyx and lower part of the sacrum.

The *uses* of these muscles are expressed by their names. In the female the perineal muscles are smaller, and are modified to the difference in organization. The muscle corresponding with the accelerator urinæ in the male, is called *constrictor vaginæ;* and the analogue of the erector penis, is called *erector clitoridis.*

MUSCLES OF THE UPPER EXTREMITY.

These may be conveniently grouped according to different regions of the limb.

Thoracic Region.—This region comprises three anterior and one ateral muscle: 1. *Pectoralis major; arises* from the sternal two thirds of the clavicle, the whole length of the sternum, the cartilages of all the true ribs except the first and last, and from the aponeurosis of the external oblique muscle; *inserted* by a broad tendon into the anterior bicipital ridge of the humerus. 2. *Pectoralis minor arises* by three

digitations from the third, fourth, and fifth ribs; *inserted* into the coracoid process of the scapula. 3. *Subclavius; arises* from the cartilage of the first rib; *inserted* into the under surface of the clavicle. 4. *Serratus magnus; arises* by fleshy serrations from the nine upper ribs, excepting the first; *inserted* into the whole length of the base of the scapula anteriorly.

Uses.—The pectoralis major draws the arm against the chest; its upper fibres assist in raising, and its lower in depressing the shoulder. When its fixed point is at the shoulder, it assists in elevating and expanding the chest. The minor pectoral muscle acts with the former, and assists in the rotatory movement of the scapula upon the chest. The subclavius draws the clavicle downward and forward in steadying the shoulder. All these muscles are called into action in forced respiration, but cannot act unless the shoulders are fixed. The serratus raises the ribs, and thereby increases the cavity of the chest in inspiration. When it acts upon the scapula, the shoulder is drawn forward, as in many cases of diseased lungs and deformed chests.

Scapular Region.—Six muscles: 1. *Subscapularis; arises* from nearly the whole of the under surface of the scapula; *inserted* by a broad, thick tendon into the lesser tuberosity of the humerus. 2. *Supra-spinatus; arises* from the whole of the supra-spinous fossa; *inserted* into the upper depression of the great tuberosity of the humerus. 3. *Infra-spinatus; arises* from the whole of the infra-spinous fossa; *inserted* into the middle depression upon the greater tuberosity of the humerus. 4. *Teres minor; arises* from the middle third of the lower border of the scapula; *inserted* into the lower depression on the greater tuberosity of the humerus. 5. *Teres major; arises* from the lower third of the inferior border of the scapula; *inserted* into the posterior bicipital ridge. 6. *Deltoid*, a large triangular muscle forming the convexity of the shoulder; *arising* from the outer third of the clavicle, the acromion process, and from the whole length of the scapula; its fibres converge to the middle of the outer side of the humerus, where they are *inserted* into a rough elevation.

Uses.—The subscapularis rotates the head of the humerus inward; when the arm is raised it draws the humerus downward. It is a powerful defence to the shoulder joint. The supra-spinatus raises the arm feebly from the side; the infra-spinatus and teres minor rotate the head of the humerus outward; the teres minor assists its rotation inward carrying it also toward the side, and somewhat backward. The most important use of the supra-spinatus, infra-spinatus, and teres minor is to protect the joint against displacement, for which purpose their

Fig 53.

MUSCLES OF THE UPPER ARM.

tendons, with that of the subscapularis, are in immediate contact, forming a part of its ligamentous capsule. They are, consequently, generally ruptured in luxations of the shoulder joint.

Fig. 53 exhibits the muscles of the anterior aspect of the upper arm. 1. Coracoid process of the scapula. 2. Coraco-clavicular ligament passing outward to the scapular end of the clavicle. 3. Coraco-acromial ligament, passing outward to the acromion. 4. Subscapularis. 5. Teres major; through the triangular space above the dorsalis scapulæ vessels pass. 6. Coraco-brachialis. 7. Biceps. 8. Upper end of the radius. 9. Brachialis anticus; a portion of this muscle is seen on the outer side of the tendon of the biceps. 10. Internal head of the biceps.

HUMERAL REGION.—Four muscles: the first three are anterior, the last posterior. 1. *Coraco-brachialis; arises* from the coracoid process; *inserted* into a rough line on the inner side of the middle of the humerus. 2. *Biceps; arises* by two tendons, one, called the *short head*, from the coracoid process; the other, the *long head*, which passes through the capsular ligament of the joint, from the upper part of the glenoid cavity; *inserted* by a rounded tendon into the tubercle of the radius. 3. *Brachialis anticus*, a broad muscle covering the anterior surface of the lower part of the humerus; *arises* from fleshy serrations on both sides of the insertion of the deltoid, the anterior surface of the humerus, and from the intermuscular septa attached to the condyloid ridges; its fibres converging are *in-*

Fig. 54.

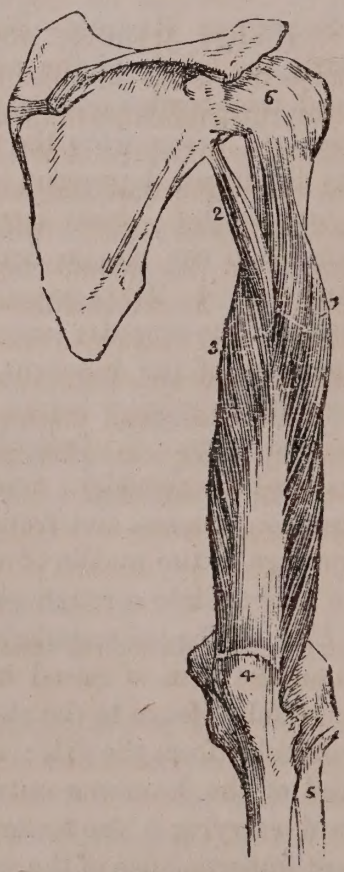


Fig. 54 is a posterior view of the upper arm, showing the triceps muscle. 1. Its external head. 2. Its long, or scapular head. 3. Its internal, or short head. 4. Olecranon process of the ulna. 5. Radius. 6. Capsular ligament.

TRICEPS MUSCLE

serted into the coronoid process of the ulna. 4. *Triceps extensor cubiti*, a three-headed muscle; the *external head arises* from the humerus, below the insertion of the teres minor, and from the intermuscular septum; the *internal head arises* from the septum and the humerus, below the insertion of the teres major; the *middle*, or *scapular head*, *arises* from the upper third of the inferior border of the scapula; the three heads unite, and form a broad muscle, which is *inserted* into the olecranon of the ulna.

Brachial Region.—This group comprises twenty muscles: the first five constitute the *anterior superficial layer;* the next three the *anterior deep layer;* the seven succeeding the *posterior superficial layer;* and the five remaining the *posterior deep layer.*

1. *Pronator radii teres; arises* by two heads, one from the inner condyle of the humerus and adjoining fascia, the other from the coronoid process of the ulna; *inserted* into the middle third of the oblique ridge of the radius. 2. *Flexor carpi radialis; arises* from the inner condyle and intermuscular fascia, and its tendon, passing through a groove formed by the scaphoid and trapezium, is *inserted* into the base of the metacarpal bone of the index finger. 3. *Palmaris longus; arises* with the preceding; *inserted* into the annular ligament and palmar fascia. 4. *Flexor sublimis digitorum; arises* from the inner condyle, internal lateral ligament, coronoid process of the ulna, and oblique ridge of the radius, and divides into four tendons, which pass beneath the annular ligament into the palm of the hand; *inserted* into the base of the second phalanges of the fingers. 5. *Flexor carpi ulnaris; arises* by two heads, one from

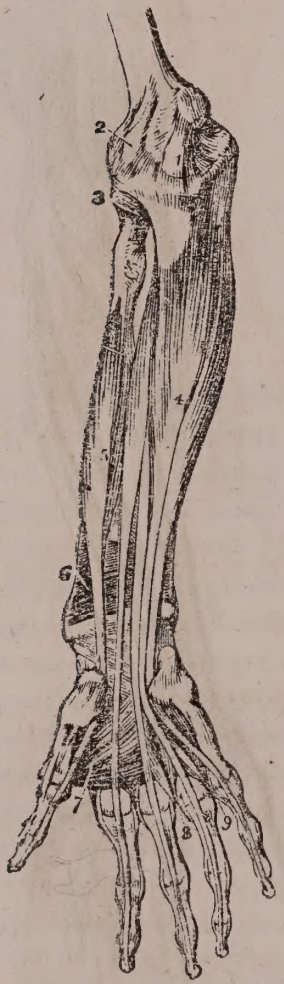
Fig. 55.

SUPERFICIAL ANTERIOR LAYER.

In Fig. 55 is seen the superficial layer of the muscles of the fore-arm. 1. Lower part of the biceps, with its tendon. 2. Part of the brachialis anticus. 3. Part of the triceps. 4. Pronator radii teres. 5. Flexor carpi radialis. 6. Palmaris longus. 7. One of the fasciculi of the flexor sublimis digitorum. 8. Flexor carpi ulnaris. 9. Palmar fascia. 10. Palmaris brevis. 11. Abductor pollicis. 12. One portion of the flexor brevis pollicis. 13. Supinator longus. 14. Extensor ossis metacarpi, and extensor primi internodii pollicis, curving around the lower border of the fore-arm.

the inner condyle, the other from the olecranon and upper two thirds of the inner border of the ulna; its tendon is *inserted* into the pisiform bone, and base of the metacarpal bone of the little finger. 6. *Flexor profundus digitorum; arises* from the upper two thirds of the ulna and part of the interosseous membrane, and terminates in four tendons, which pass beneath the annular ligaments, to be *inserted* into the base of the last phalanges. 7. *Flexor longus pollicis; arises* from the upper two thirds of the radius and part of the interosseous membrane; its tendon passes beneath the annular ligament to be *inserted* into the last phalanx of the thumb. 8. *Pronator quadratus; arises* from the ulna; *inserted* into the lower part of the oblique line on the outer side of the radius.

Fig. 56.



DEEP ANTERIOR LAYER

In Fig. 56 is seen the deep layer of muscles of the fore-arm. 1. Internal lateral ligament of the elbow joint. 2. Anterior ligament. 3. Orbicular ligament of the head of the radius. 4. Flexor profundus digitorum. 5. Flexor longus pollicis. 6. Pronator quadratus. 7. Adductor pollicis. 8. Dorsal interosseous muscle of the middle finger, and palmar interosseous of the ring finger. 9. Dorsal interosseous muscle of the ring finger, and palmar interosseous of the little finger.

9. *Supinator longus; arises* from the external condyloid region of the humerus, and, passing along the radial border of the fore-arm, is *inserted* into the styloid process of the ulna. 10. *Extensor carpi radialis longus; arises* from the humerus below the preceding; *inserted* into the base of the metacarpal bone of the index finger. 11. *Extensor carpi radialis brevis; arises* adjoining the preceding; *inserted* into the base of the metacarpal bone of the middle finger. 12. *Extensor communis digitorum; arises* with the preceding, and divides into four tendons, which are *inserted* into the second and third phalanges of the fingers. 13. *Extensor minimi digiti*, is an offset from the extensor communis; *inserted* into the last two phalanges. 14. *Extensor carpi ulnaris; arises* from the external condyle and upper two thirds of the border of the ulna; *inserted* into the metacarpal bone of the little finger. 15. *Anconeus*, a small triangular muscle, *arising* from the outer condyle; *inserted* in the olecranon and upper end of the ulna.

In Fig. 57 is seen the superficial layer of the muscles of the posterior aspect of the fore-arm. 1. Lower part of the biceps. 2. Part of the brachialis anticus. 3. Lower part of the triceps inserted into the olecranon. 4. Supinator longus. 5. Extensor carpi radialis longior. 6. Extensor carpi radialis brevior. 7. Tendons of insertion of these muscles. 8. Extensor digitorum communis. 9. Extensor minimi digiti. 10. Extensor carpi ulnaris. 11. Anconeus. 12. Part of the flexor carpi ulnaris. 13. Extensor ossis metacarpi and extensor primi internodii, lying together. 14. Extensor secundi internodii; its tendon is seen crossing the two tendons of the extensor carpi radialis longior and brevior. 15. Posterior annular ligament. The tendons of the common extensor are seen upon the back of the hand, and their mode of distribution on the dorsum of the fingers.

Fig. 57.

SUPERFICIAL LAYER POSTERIORLY

16. *Supinator brevis; arises* from the external condyle, lateral and orbicular ligament, and the ulna, and winds around the upper part of the radius, to be *inserted* into the upper third of its oblique line. 17. *Extensor ossis metacarpi pollicis; arises* from the ulna, radius, and interosseous membrane, and is *inserted* into the base of the metacarpal bone of the thumb. 18. *Extensor primi internodii pollicis; arises* from the interosseous membrane and ulna, and is *inserted* into the base of the first phalanx of the thumb. 19. *Extensor secundi internodii pollicis; arises* with the preceding, and is *inserted* into the base of the last phalanx of the thumb. 20. *Extensor indicis; arises* with and a little above the two preceding; *inserted* into the aponeurosis formed by the common extensor tendon of the index finger.

NOTE.—The tendons of the flexor and extensor muscles of the fore arm are provided with synovial bursæ, as they pass beneath the annular ligament; those of the back of the wrist have distinct sheaths formed by the posterior annular ligament. These bursæ are small membranous sacs filled with a mucous fluid, and they serve as soft cushions for the tendons to play upon, in a situation exposed to a great degree and rapidity of motion. The advantages and even necessity of an additional covering, or distinct sheath, for the tendons on the back of the wrist, is obvious, from their exposed situation and feeble protection by flesh and integument.

Fig. 58

DEEP LAYER POSTERIORLY.

Fig. 58 exhibits the deep layer of muscles on the posterior aspect of the fore-arm. 1. Lower part of the humerus. 2. Olecranon. 3. Ulna. 4. Anconeus. 5. Supinator brevis. 6. Extensor ossis metacarpi pollicis. 7. Extensor primi internodii pollicis. 8. Extensor secundi internodii pollicis. 9. Extensor indicis. 10. First dorsal interosseous ligament. The other three dorsal interossii are seen between the metacarpal bones of their respective fingers.

Uses.—The pronator radii teres and pronator quadratus rotate the radius upon the ulna, producing pronation of the hand. The flexor carpi radialis and ulnaris bend the wrist; the flexor sublimis and profundus bend the second and last joints of the fingers; the flexor longus pollicis bends the last joint of the thumb. The palmaris longus draws the palmar fascia tense, and assists in the flexion of the wrist and fore-arm. The anconeus assists the triceps in extending the fore-arm upon the arm; the supinatus longus and brevis produce supination of the fore-arm, and antagonize the pronators; the extensor carpi radialis longior and brevior, and ulnaris, extend the wrist, antagonizing the two flexors of the carpus. The extensor communis digitorum extends the fingers, antagonizing the flexors, sublimis, and profundus. The extensor ossi metacarpi, primi internodii, and secundi internodii pollicis, are the special extensors of the thumb, and counterbalance the actions of the flexor ossis metacarpi, flexor brevis, and flexor longus pollicis. The extensor indicis extends the first finger, and is hence called "indicator;" the extensor minimi digiti is the special extensor of the little finger, enabling it to be extended distinctly from the other fingers.

MUSCLES OF THE HAND.

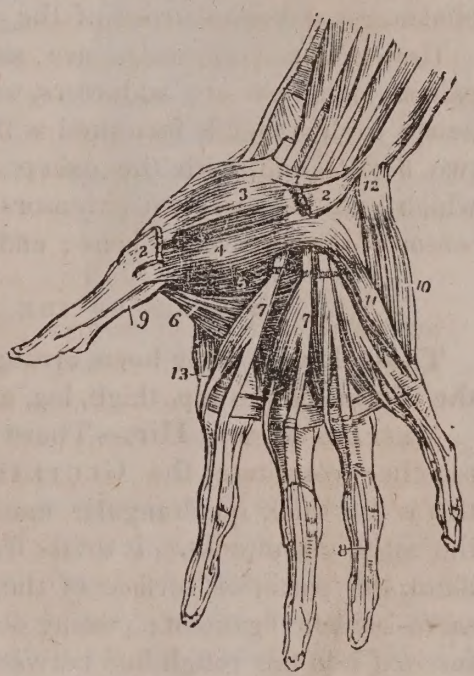
RADIAL REGION.—Four muscles: 1. *Abductor pollicis: arises* from the scaphoid and annular ligament; *inserted* into the base of the first phalanx of the thumb. 2. *Flexor ossis metacarpi; arises* from the trapezium and annular ligament; *inserted* into the whole length of the metacarpal bone. 3 *Flexor brevis pollicis:* its *external* portion *arises*

with the preceding; its *internal* from the trapezoides and os magnum; both are *inserted* into the base of the first phalanx of the thumb, having each a sesamoid bone in the tendon to protect the joint. 4. *Adductor pollicis; arises* from the whole length of the metacarpal bone of the middle finger, and its converging fibres are *inserted* into the base of the first phalanx.

Uses.—These muscles, as their names import, produce in the thumb the movements of abduction, adduction, and flexion.

Fig. 59.

The muscles of the hand are seen in Fig. 59. 1. Annular ligament. 2, 2. Origin and insertion of the abductor pollicis, the middle portion being removed. 3. Flexor ossis metacarpi. 4. One portion of the flexor brevis pollicis. 5. Its deep portion. 6. Adductor pollicis. 7, 7. Lumbricales, arising from the deep flexor tendons, on which the numbers are placed, the tendons of the flexor sublimis having been removed from the palm. 8. One of the tendons of the deep flexor, passing between the two terminal slips of the tendon of the flexor sublimis, to reach the last phalanx. 9. Tendon of the flexor longus pollicis, passing between the two portions of the flexor brevis to the last phalanx. 10. Abductor minimi digiti. 11. Flexor brevis minimi digiti; the edge of the flexor ossis metacarpi is seen projecting beyond the inner border of the flexor brevis. 12. Prominence of the pisiform bone. 13. First dorsal interosseous muscle.



MUSCLES OF THE HAND.

Ulnar Region.—Four muscles: 1. *Palmaris brevis;* a thin plane *arising* from the annular ligament and palmar fascia, and passing transversely inward, is *inserted* into the integuments on the inner border of the hand. 2. *Abductor minimi digiti;* a small tapering slip, *arising* from the pisiform bone; *inserted* into the base of the first phalanx of the little finger. 3. *Flexor brevis minimi digiti;* a small muscle, *arising* from the unciform bone and annular ligament; *inserted* into the base of the first phalanx. 4. *Flexor ossis metacarpi; arises* with the preceding; *inserted* into the whole length of the metacarpal bone of the little finger.

Uses.—These muscles are subservient to the motions of the little finger.

Palmar Region.—Three sets of muscles: 1. *Lumbricales;* four

in number, *arising* from the tendons of the deep flexor, and *inserted* into the aponeurotic expansion of the extensor tendons on the radial side of the fingers. 2. *Palmar interossei;* three in number, each *arising* from the base of the metacarpal bone of one finger, and are *inserted* into the base of the first phalanx and aponeurotic expansion of the extensor tendon of the same finger, the middle one being excepted. 3. *Dorsal interossei;* these are situated in the four spaces between the metacarpal bones; they *arise* by two heads from the adjoining sides of the base of the metacarpal bones; *inserted* into the base of the first phalanges, and aponeurosis of the extensor tendons.

Uses.—The lumbricales are auxiliary to the deep flexors; the palmar interossei are adductors, and the dorsal interossei abductors; hence each finger is furnished with its proper adductor and abductor, two flexors, and, with the exception of the middle and ring fingers, which have but one, two extensors. The thumb has a flexor and extensor of the metacarpal bone; and the little finger a metacarpal flexor.

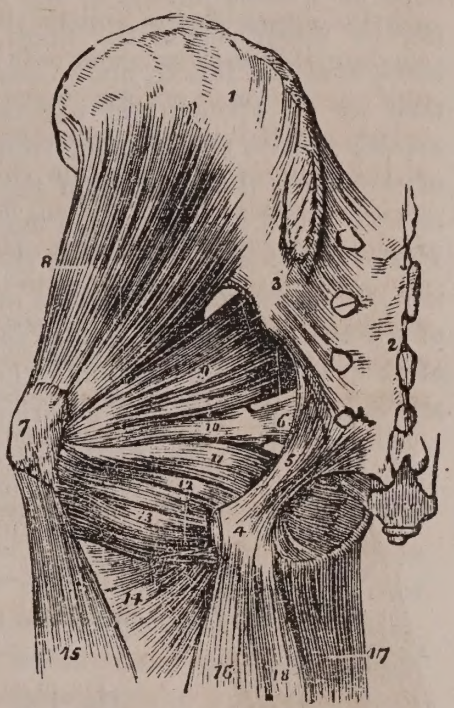
MUSCLES OF THE LOWER EXTREMITY.

These have usually been arranged into groups corresponding with the regions of the hip, thigh, leg, and foot.

MUSCLES OF THE HIP.—There are nine muscles of the hip, which together constitute the GLUTEAL REGION: 1. *Gluteus maximus*, this is the thick quadrangular mass of flesh forming the convexity of the nates, or buttocks. It *arises* from the back part of the crest of the ilium, the posterior surface of the sacrum and coccyx, and the great sacro-ischiatic ligament; passing obliquely outward and downward, it is *inserted* into the rough line between the trochanter major to the linea aspera; by means of its tendon it is continuous with the fascia lata covering the outer side of the thigh. Between its broad tendon and the femur a large bursa is situated. 2. *Glutæus medius; arises* from the outer lip of the crest of the ilium for four fifths of its length, and from the dorsum ilii and surrounding fascia; its fibres converge to the outer part of the trochanter major, into which its tendon is *inserted.* 3. *Gluteus minimus; arises* from the surface of the dorsum ilii; its fibres converge to the anterior border of the trochanter major, where they are *inserted* by a rounded tendon. 4. *Pyriformis;* a pear-shaped muscle, *arising* from the anterior surface of the sacrum and ilium adjoining; it passes out of the pelvis through the great sacro-ischiatic foramen; *inserted*, by a rounded tendon, into the trochanteric fossa of the femur. 5. *Gemellus superior;* a small slip *arising* from the spine of the ischium, and *inserted* into the tendon of the obturator internus, and into the trochanteric fossa. 6. *Obturator internus: arises* from

the inner surface of the anterior wall of the pelvis; passes out of the pelvis through the lesser sacro-ischiatic foramen, and is *inserted* into the trochanteric fossa.

Fig. 60.



DEEP GLUTEAL MUSCLES

Fig. 60 shows the deep muscles of the gluteal region. 1. External surface of the ilium. 2. Posterior surface of the sacrum. 3. Posterior sacro-iliac ligaments. 4. Tuberosity of the ischium. 5. Great or posterior sacro-ischiatic ligament. 6. Anterior or lesser sacro-ischiatic ligament. 7. Trochanter major. 8. Gluteus minimus. 9. Pyriformis. 10. Gemellus superior. 11. Obturator internus, passing out of the lesser sacro-ischiatic foramen. 12. Gemellus inferior. 13. Quadratus femoris. 14. Adductor magnus, its upper part. 15. Vastus externus. 16. Biceps. 17. Gracilis. 18. Semitendinosus.

7. *Gemellus inferior; arises* from the anterior point of the tuberosity of the ischium; *inserted* into the trochanteric fossa and tendon of the obturator internus. 8. *Obturator externus; arises* from the obturator membrane and surrounding bone; its tendon passes behind the neck of the femur, to be *inserted* into the trochanteric fossa. 9. *Quadratus femoris*, a square muscle *arising* from the external border of the tuberosity of the ischium; *inserted* into a rough line, called *linea quadrati*, on the posterior border of the trochanter major.

Uses.—The glutei are abductors of the thigh, when acting from the pelvis; when the thigh is their fixed point, they steady the pelvis on the head of the thigh bone, as in standing; they also assist in carrying the leg forward in walking; the minimus rotates the limb slightly inward: the medius and maximus rotate it outward. The other muscles of this group are called *external rotators*, their office being to rotate the limb outwardly, everting the knee and foot.

MUSCLES OF THE THIGH.

These are divided into three regions—*anterior*, *internal*, and *posterior*.

Anterior Femoral Region.—Six muscles: 1. *Tensor vaginæ femoris*, a short flat muscle on the outer side of the hip, *arising* from the crest of the ilium, near its anterior superior spine; *inserted* between two layers of the fascia lata at one fourth down the thigh. 2. *Sartorius*

(tailor's muscle); a long ribbon-like muscle, *arising* from the anterior superior spinous process of the ilium, and the notch below, and crossing the upper part of the thigh obliquely, descends behind the inner condyle of the femur, and is *inserted* into the inner tuberosity of the tibia *by* an aponeurotic expansion. 3. *Rectus;* a straight muscle, *arising* by two tendons, one from the anterior inferior spinous process of the ilium, the other from the upper lip of the acetabulum; *inserted* by a broad, strong tendon into the upper border of the patella. 4. *Vastus externus; arises* from the inner border of the patella; *inserted* into the femur and outer side of the linea aspera, as high as the base of the trochanter. 5. *Vastus internus; arises* from the inner border of the patella; *inserted* into the femur and inner side of the linea aspera as high up as the anterior intertrochanteric line. 6. *Crureus; arises* from the upper border of the patella; *inserted* into the front aspect of the femur, as high as the anterior intertrochanteric line.

Fig. 61.

ANTERIOR FEMORAL MUSCLES.

NOTE.—The two vasti and crureus together constitute the *triceps extensor cruris*.

Fig. 61 shows the muscles of the anterior femoral region. 1. Crest of the ilium. 2. Its anterior superior spinous process. 3. Gluteus medius. 4. Tensor vaginæ femoris; its insertion into the fascia lata is seen inferiorly. 5. Sartorius. 6. Rectus. 7. Vastus externus. 8. Vastus internus. 9. Patella. 10. Iliacus internus. 11. Psoas magnus. 12. Pectineus. 13. Adductor longus. 14. Part of the adductor magnus. 15. Gracilis.

Uses.—The tensor vaginæ femoris stretches the fascia lata, rendering it tense, and slightly inverting the limb; the sartorius bends the leg upon the thigh, and the thigh upon the pelvis, carrying the leg across that of the opposite side —the tailor's sitting position; when fixed below it assists the extensors of the leg in supporting the trunk. The four remaining muscles extend the leg upon the thigh. By their attachment to the patella, which acts as a fulcrum, they are advantageously disposed for great power When their fixed point is from the tibia they steady the thigh upon the leg; and the rectus, by its attachment to the pelvis, serves to balance the trunk upon the lower extremity.

INTERNAL FEMORAL REGION.—Seven muscles: 1. *Iliacus internus;* a flat radiated muscle, *arising* from the inner concave surface of the ilium, and, joining with the tendon of the psoas, is *inserted* into the trochanter minor of the femur. 2. *Psoas magnus; arises* from the intervertebral substances, part of the bodies and bases of the transverse processes of the lumbar vertebræ, and from tendinous arches thrown across the constricted portion of the last dorsal and four upper lumbar vertebræ, and, passing along the margin of the brim of the pelvis and beneath Poupart's ligament, its tendon, united with that of the iliacus internus, is *inserted* into the posterior part of the trochanter minor, a bursa being interposed. 3. *Pectineus;* a flat quadrangular muscle, *arising* from the pectineal line of the pubis and surface of bone in front; *inserted* into the femur, between the anterior intertrochanteric line and the linea aspera. 4. *Adductor longus; arises* by a round tendon from the front surface of the pubis below the angle; *inserted* into the middle third of the linea aspera. 5. *Adductor brevis; arises* from the body and ramus of the pubis; *inserted* into the upper third of the linea aspera. 6. *Adductor magnus;* a broad triangular muscle; *arises* from the ramus of the pubes and ischium, and tuber ischii, and, radiating outward, is *inserted* into the whole length of the linea aspera and inner condyle of the femur. 7. *Gracilis;* a slender muscle, *arising* from the body of the os pubis, and ramus of the pubis and ischium; *inserted* into the inner tuberosity of the tibia.

Uses.—The iliacus, psoas, pectineus, and adductor longus bend the thigh upon the pelvis, and rotate the entire limb outward; the pectineus and adductors move the limb outward powerfully. The gracilis assists in adduction, and contributes also to the flexion of the leg.

POSTERIOR FEMORAL REGION.—Three muscles: 1. *Biceps femoris;* double-headed, one head *arising* in common with the semi-tendinosus, the other from the lower two thirds of the linea aspera; *inserted* by a strong tendon into the head of the fibula; a portion of its tendon is continued into the fascia of the leg, and another is attached to the outer tuberosity of the tibia. 2. *Semi-tendinosus;* remarkable for its long tendon; *arises* from the tuberosity of the ischium with the long head of the biceps; *inserted* into the inner tuberosity of the tibia. 3. *Semi-membranosus;* named from its tendinous expansion; *arises* from the tuberosity of the ischium in front of the preceding; *inserted* into the back part of the inner tuberosity of the tibia.

NOTE.—The biceps forms the *outer hamstring;* the tendons of the semi-tendinosus, semi-membranosus, gracilis, and sartorius form the *inner hamstring.*

Uses.—These muscles are the direct flexors of the leg upon the thigh; those fibres which originate from below also balance the pelvis on the lower extremities. The biceps everts the leg when partially flexed, and the semi-tendinosus turns it inward when partially flexed.

Fig. 62.

POSTERIAL FEMORAL MUSCLE.

Fig. 62 exhibits the muscles of the posterior femoral and gluteal region. 1. Glutæus medius. 2. Glutæus maximus. 3. Vastus externus covered in by fascia lata. 4. Long head of the biceps. 5. Its short head. 6. Semi-tendinosus. 7. Semi-membranosus. 8. Gracilis. 9. Part of the inner border of the adductor magnus. 10. Edge of the sartorius. 11. The popliteal space. 12. Gastrocnemius; its two heads.

MUSCLES OF THE LEG.

They are divided into three regions: anterior tibial, fibular, and posterior tibial.

Anterior Tibial Region.—Four muscles: 1. *Tibialis anticus; arises* from the upper two thirds of the tibia, the interosseous membrane, and the deep fascia; its tendon passes through a distinct sheath in the annular ligament, and is *inserted* into the inner side of the internal cuneiform bone, and base of the metatarsal bone of the great toe. 2. *Extensor longus digitorum; arises* from the head of the tibia, upper three fourths of the fibula, interosseous membrane, and from the deep fascia; below it divides into four tendons, which pass beneath the annular ligament, and are *inserted* into the second and third phalanges of the four lesser toes. 3. *Peroneus tertius; arises* from the lower fourth of the tibia; *inserted* into the base of the metatarsal bone of the little toe. 4. *Extensor proprius pollicis; arises* from the lower two thirds of the fibula and interosseous membrane; *inserted* into the base of the last phalanx of the great toe.

Uses.—The first two are direct flexors, bending the foot upon the leg; acting with the tibialis posticus, they direct the foot inward, and with the peroneus longus and brevis, outward. They help to maintain the flatness of the foot during progression. The extensor longus digitorum and extensor proprius pollicis are direct extensors of the toes; they also assist the flexion of the entire foot upon the leg. When acting from below they increase the firmness of the ankle joint.

Posterior Tibial Region.—Seven muscles; the first three make the *superficial group;* the last four the deep layer: 1. *Gastrocnemius; arises* by two heads from the two condyles of the femur, which, uniting to form the bellied part of the leg, are *inserted*, by means of the tendo Achillis, into the lower part of the tuberosity of the os calcis, a synovial bursa being interposed between the tendon and bone. 2. *Plantaris*, a very small muscle, *arising* from the outer condyle of the femur, and *inserted*, by a long, slender tendon, into the os calcis, by the side of the tendo Achillis. 3. *Soleus*, a broad muscle, *arising* from the head and upper third of the fibula, and oblique line and middle third of the tibia; its fibres converge to the tendo Achillis, by which it is *inserted* into the os calcis.

Uses.—These three muscles of the calf draw powerfully on the os calcis, lift the heel, and continuing their action, raise the entire body. They are the principal muscles in walking, leaping, and dancing. When they are fixed below they steady the leg upon the foot.

Fig. 63.

SUPERFICIAL TIBIAL MUSCLES

The superficial muscles of the posterior aspect of the leg are shown in Fig. 63. 1. Biceps, forming the outer hamstring. 2. The tendons forming the inner hamstring. 3. Popliteal space. 4. Gastrocnemius. 5, 5. Soleus. 6. Tendo Achillis. 7. Posterior tuberosity of the os calcis. 8. Tendons of the peroneus longus and brevis, passing behind the outer ankle. 9. Tendons of the tibialis posticus and flexor longus digitorum, passing into the foot behind the ankle.

4. *Popliteus; arises* by a rounded tendon from a deep groove on the outer side of the external condyle of the femur, beneath the external lateral ligament, and spreading obliquely over the head of the tibia, is *inserted* into the bone above its oblique line. 5. *Flexor longus pollicis; arises* from the lower two thirds of the fibula, and passing through a groove in the astragalus and os calcis, is *inserted* into the bone of the last phalanx of the great toe. 6. *Flexor longus digitorum; arises* from the surface of the tibia, below the popliteal line; its tendon passes through a sheath with the tibialis posticus behind the inner malleolus, and then through a second sheath connected with a groove in the astragalus and os calcis, into the sole of the foot, where it divides into four tendons, which are *inserted* into the base of the last phalanx of the four lesser toes, perforating the tendons of the flexor brevis digitorum. 7. *Tibialis*

posticus; *arises* by two heads from the adjacent sides of the tibia and fibula their whole length, and from the interosseous membrane; its tendon runs into the sheath with the flexor longus digitorum, passes through its proper sheath over the deltoid ligament, and is *inserted* into the tuberosity of the scaphoid and internal cuneiform bone.

Uses.—The popliteus flexes the leg upon the thigh, at the same time carrying it inward, so as to invert the leg. The flexors are connected in the foot by a tendinous band, so that they act together in bending the toes. The tibialis posticus extends the tarsus upon the leg, antagonizing the tibialis anticus. These last two combine in adducting the foot.

Fibular Region.—Two muscles: 1. *Peroneus longus; arises* from the head and upper third of the outer side of the fibula, and terminates in a long tendon which passes behind the external malleolus, and obliquely across the sole of the foot; *inserted* into the base of the metatarsal bone of the great toe. 2. *Peroneus brevis*, lies beneath the former, *arising* from the lower half of the fibula, and terminates in a tendon which passes behind the external malleolus, and through a groove in the os calcis, to be *inserted* into the base of the metatarsal bone of the little toe.

Uses.—The peronei are extensors of the foot, conjointly with the tibialis posticus, and antagonize the tibialis anticus and peroneus tertius. All of these acting together maintain the foot in a flat position, as in walking.

MUSCLES OF THE FOOT.

These may be arranged, according to their situation above or below, into those of the *dorsal* and those of the *plantar* regions.

Dorsal Region.—Two muscles: 1. *Extensor brevis digitorum; arises* from the outer side of the os calcis, crosses the foot obliquely, and terminates in four tendons, one of which is *inserted* into the first phalanx of the great toe, and the others into the sides of the long extensor tendons of the second, third, and fourth toes. 2. *Dorsal interossei*; these are placed between the metatarsal bones.

Plantar Region.—The muscles of this region are subdivided into four *layers*.

First Layer.—Three muscles: 1. *Abductor pollicis*, lies along the inner border of the foot, one head *arising* from the inner tuberosity of the os calcis, the other from the internal annular ligament and plantar fascia; *inserted* into the first phalanx of the great toe, and internal sesa-

moid bone. 2. *Abductor minimi digiti*, lies along the outer border of the foot, *arising* from the outer tuberosity of the os calcis, and plantar fascia; *inserted* into the base of the first phalanx of the little toe. 3. *Flexor brevis digitorum*, situated between the two preceding; *arises* from the under-surface of the os calcis, from the plantar fascia and intermuscular septa; *inserted*, by four tendons, into the base of the second phalanx of the four lesser toes.

Fig. 64.

FIRST LAYER PLANTAR MUSCLES.

The first layer of muscles in the sole of the foot is shown in Fig. 64. 1. Os calcis. 2. Posterior part of the plantar fascia divided transversely. 3. Abductor pollicis. 4. Abductor minimi digiti. 5. Flexor brevis digitorum. 6. Tendon of the flexor longus pollicis. 7, 7. Lumbricales.

Second Layer.—Two muscles: 1. *Musculus accessorius; arises* by two slips from either side of the under surface of the os calcis; *inserted* into the outer side of the tendon of the flexor longus digitorum. 2. *Lumbricales*, four muscular slips, *arising* from the tibial side of the tendon of the flexor longus digitorum; *inserted* into the expansion of the extensor tendons, and base of the first phalanx of the four lesser toes.

Fig. 65.

PLANTAR MUSCLES

The third and part of the second layer of muscles of the sole of the foot are seen in Fig. 65. 1. Divided edge of the plantar fascia. 2. Musculus accessorius. 3. Tendon of the flexor longus digitorum. 4. Tendon of the flexor longus pollicis. 5. Flexor brevis pollicis. 6. Adductor pollicis. 7. Flexor brevis minimi digiti. 8. Transversus pedis. 9. Dorsal and plantar interossei. 10. Convex ridge formed by the tendon of the peroneus longus in its oblique course across the foot.

Third Layer.—Four muscles: 1. *Flexor brevis pollicis; arises* from the side of the cuboid, and from the external cuneiform bone; *inserted* by two heads into the base of the first phalanx of the great toe. Two sesamoid bones are found in these tendons. 2. *Adductor pollicis; arises* from the cuboid bone and sheath of the tendon of the peroneus longus, and from the base of the third and fourth metatarsal bones; *inserted* into the base of the first phalanx of the great toe. 3. *Flexor brevis minimi digiti; arises* from the base

Fig. 66.

DEEP PLANTAR MUSCLES.

of the metacarpal bone of the little toe, and sheath of the peroneal tendon; *inserted* into the base of the first phalanx of the little toe. 4. *Transversus pedis; arises* by fleshy slips from the heads of the metatarsal bones of the four lesser toes; *inserted* into the base of the first phalanx of the great toe, its tendon being blended with that of the adductor pollicis

Fig. 66 shows the deep-seated muscles in the sole of the foot. 1. Tendon of the flexor longus pollicis. 2. Tendon of the flexor communis digitorum pedis. 3. Flexor accessorius 4, 4. Lumbricales. 5. Flexor brevis digitorum. 6. Flexor brevis pollicis pedis. 7. Flexor brevis minimi digiti pedis.

Fourth Layer.—One set of muscles: *Interossei plantares;* three in number, placed upon the metatarsal bones; *arising* by the base of the metatarsal bones of the three outer toes; *inserted* into the inner side of the extensor tendon and base of the first phalanx of the same toes.

Fig. 67.

PLANTAR INTEROSSEI.

The interossei plantares are seen in Fig. 67. 1. Abductor tertii. 2. Abductor quarti. 3. Interossei minimi digiti.

Uses.—All the muscles of the foot act upon the toes, the action and nature and situation of each muscle being expressed by its name. The movements of the toes are flexion, extension, adduction, and abduction. The great toe, like the thumb, is provided with special muscles for independent action. The lumbricales are assistants to the long flexor; and the transversus pedis is placed across the foot for the purpose of drawing the toes together.

The firm articulations of all the metacarpal bones, and the great strength and number of the ligaments and tendons of the leg, feet, and toes, are admirably adapted for combining power of endurance with facility of motion; the toes generally have four flexors, two extensors, four adductors, and four abductors; while the great toe, in addition, has two distinct flexors, two extensors, one adductor, and one abductor.

CHAPTER IV.

OF THE FASCIÆ—APONEUROLOGY.

THE soft structures and delicate organs of the body are every where invested with protecting coats, or bandages, called fasciæ. They are composed of laminæ of various thickness, and are divided into cellulo-fibrous and aponeurotic.

The *cellulo-fibrous fascia* invests the whole body between the skin and the deeper parts, and affords a medium of connection between them. It is composed of fibrous tissue, arranged in a cellular form, the cells containing adipose substance, thus affording a yielding and elastic structure, through which the minute vessels and nerves pass to the papillary layer of the skin, without obstruction or injury from pressure. By dissection it may be separated into two layers, between which the subcutaneous vessels and nerves are found. In some situations this fascia is condensed into strong inelastic membrane, as in the deep fascia of the neck and thorax, and the sheaths of vessels.

Fig. 68.

DISTRIBUTION OF THE FASCIA.

Fig. 68 is a transverse section of the neck, showing the deep cervical fascia and its numerous prolongations, forming sheaths for the different muscles. 1. Platysma myoides. 2. Trapezius. 3. Ligamentum nuchæ, from which the fascia may be traced forward beneath the trapezius, inclosing the other muscles of the neck. 4. Division of the fascia to form a sheath for the sterno-mastoid muscle (5). 6. Point of reunion. 7. Union of the deep fascia of opposite sides of the neck. 8. Section of the sterno-hyoid. 9. Omo-hyoid. 10. Sterno-thyroid. 11. Lateral lobe of the thyroid gland. 12. Trachea. 13. Æsophagus 14. Sheath containing the common carotid artery, internal jugular vein, and pneumogastric nerve. 15. Longus colli; the sympathetic nerve is in front. 16. Rectus anticus major. 17. Scalenus anticus. 18. Scalenus posticus. 19. Splenius capitis. 20. Splenius colli. 21. Levator anguli scapulæ. 22. Complexus. 23. Trachleo-mastoid. 24. Transversalis colli. 25. Cervicalis ascendens. 26. Semi-spinalis colli. 27. Multifidus spinæ. 28. A cervical vertebra; the transverse processes are seen to be traversed by the vertebral artery and vein.

The *aponeurotic fascia* is strong and inelastic, composed of parallel tendinous fibres, connected by others passing in different directions

In the limbs it forms distinct sheaths, inclosing all the muscles and tendons, constituting the deep fascia. It is firmly connected to the bones, and to the prominent points of the clavicle scapula, elbow, wrist, pelvis, knee, ankle, etc. Its pressure assists the muscular action and the circulation of fluids. In the palm of the hand and sole of the foot it is a powerful protection to the structures.

PRINCIPAL FASCIÆ.

Temporal Fascia.—The fascia of the temple is a strong aponeurotic membrane covering the temporal muscle on each side of the head.

Cervical Fasciæ.—The fasciæ of the neck are divided into the *superficial*, which is a part of the common superficial fascia of the entire body, and the *deep*, a strong cellulo-fibrous layer which invests the muscles of the neck, and retains and supports the vessels and nerves.

Thoracic Fascia.—The thoracic fascia is a dense layer of cellulo-fibrous membrane stretched horizontally across the superior opening of the thorax, and forming the upper boundary of the chest, as the diaphragm does the lower. It supports the heart in its situation, and also the large blood-vessels, windpipe, and æsophagus, which pass through it.

Abdominal Fasciæ.—The lower part of the walls of the abdomen, and the cavity of the pelvis, are supported on their internal surface with a layer of fascia; at the bottom of the pelvis it is reflected inward to the sides of the bladder. In different situations its parts are called *fascia transversalis*, *iliac*, and *pelvic fascia*. The transverse and iliac fasciæ meet at the crest of the ilium and Poupart's ligament; the pelvic is confined to the cavity of the true pelvis. These fasciæ are important in their relations to

INGUINAL HERNIA.

There are two kinds of inguinal hernia, oblique and direct. In the *oblique*, the intestine escapes from the abdominal cavity into the spermatic canal, through the *internal abdominal ring;* this ring is situated in the fascia transversalis, about midway between the spine of the pubis and superior anterior spine of the ilium, half an inch above Poupart's ligament. The bowel pushes along a pouch of peritoneum which forms the *hernial sac*, and distends a process of the transverse fascia. After emerging from the internal ring, it passes beneath the lower borders of the transversalis and internal oblique muscles, and finally through the external abdominal ring in the aponeurosis of the external oblique muscle. While passing the internal oblique, it receives the cremaster muscle as an additional investment, and upon protruding from the external ring, still another from the intercolumnar fascia

Hence the coverings of an inguinal hernia from the surface to the bowel are: 1. The integument. 2. Superficial fascia. 3. Intercolumnar fascia. 4. The cremaster muscle. 5. Transversalis fascia. 6. Peritoneal sac.

The *spermatic canal* is about an inch and a half in length, and in the normal condition gives passage to the spermatic cord in the male, and the round ligament of the uterus, with its vessels, in the female. It is bounded at its inner termination by the internal, and at its outer extremity by the external, abdominal ring. It is also bounded in front by the aponeurosis of the external oblique; behind by the transversalis fascia and the conjoined tendon of the internal oblique and transversalis; above by the arched borders of the same muscles; below by the grooved border of Poupart's ligament.

Of oblique inguinal hernia there are three kinds: 1. *Common oblique;* already described. 2. *Congenital;* this has no proper sac, but is contained within the tunica vaginalis; the other coverings are the same as in the first variety. It results from the pouch of the peritoneum, which is carried downward into the scrotum by the descent of the testicle in the fœtus, not closing, so that the intestine is forced into the open canal. 3. *Encysted;* a protrusion of the intestine in which the pouch of the peritoneum forming the tunica vaginalis, being only partially closed, and remaining open externally to the abdomen, admits of its passing into the scrotum behind the tunica vaginalis. The surgeon, in operating, divides three layers of serous membrane, the first and second being those of the tunica vaginalis, and the third the peritoneal layer, or true hernial sac.

Direct inguinal hernia is so called when the bowel passes directly through the external ring, forcing before it the opposing parietes. Its coverings are the same as in the oblique hernia, except that the conjoined tendon of the internal oblique and transversalis muscles form its fourth investment, instead of the cremaster muscle.

Direct inguinal hernia never attains as great bulk as the oblique form; all these varieties may descend into the cavity of the scrotum, and are then called *scrotal hernia*.

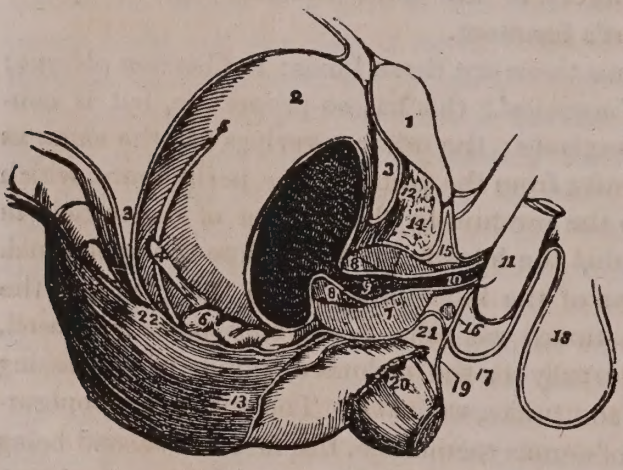
Iliac Fascia.—The iliac fascia invests the psoas and iliacus muscles; beneath the femoral arch it forms a part of the sheath of the femoral vessels.

Pelvic Fascia.—This is attached to the inner surface of the os pubis, and along the margin of the pelvis, from which it descends into the pelvic cavity, where it divides into two layers, the *pelvic* and *obturator*. The *pelvic layer* is reflected inward from near the symphisis pubis to the neck of the bladder, forming the *anterior vesical ligaments;* an

ascending reflected portion encloses the sides of the bladder and vesical plexus of veins, and forms the lateral ligament of the bladder. Other reflexions constitute layers for investing the lower portion of the alimentary canal. The *obturator layer* passes downward, covering the obturator internus muscle, and encloses the internal pudic vessels and nerves.

Perineal Fasciæ.—The *superficial perineal fascia* is a thin aponeurotic layer covering the muscles of the genital portion of the perineum. The *deep perineal fascia*, called also *Camper's*, and *triangular ligament*, is stretched across the pelvis, so as to constitute a defence to its outlet.

Fig. 69.



PELVIC FASCIA.

In the side view of the viscera of the pelvis, Fig. 69, is shown the distribution of the perineal and pelvic fasciæ. 1. Symphisis pubis. 2. Bladder. 3. The recto-vesical fold of peritoneum, passing from the anterior surface of the rectum to the back part of the bladder. 4. The ureter. 5. The vas deferens. 6. Right vesicula seminalis. 7. Prostate gland divided by a longitudinal section. 8, 8. Section of a ring of elastic tissue encircling the prostatic portion of the urethra at its commencement. 9. Prostatic urethra. 10. Membranous portion. 11. The commencement of the corpus spongiosum penis, the bulb. 12. Anterior ligaments of the bladder. 13. Edge of the pelvic fascia reflected upon the rectum. 14. Location of a plexus of veins, between the pelvic and deep perineal fascia. 15. The deep perineal fascia; its two layers. 16 Cowper's gland of the right side. 17. Superficial perineal fascia, ascending in front of the root of the penis to become continuous with the dartos of the scrotum (18). 19. Layer of the deep fascia prolonged to the rectum. 20. Lower part of the levator ani. 21. The inferior segment of the funnel-shaped process given off from the posterior layer of the deep perineal fascia, which is continuous with the recto-vesical fascia; the attachment of this fascia to the recto-vesical fold of peritoneum is seen at 22.

Fascia of the Upper Extremity.—The *superficial* contains between its layers the superficial nerves, veins, and lymphatics. The *deep* is thick upon the dorsum of the scapula, but thin in the axillary space In the fore-arm it is very strong at the elbow and wrist joints, uniting with the ligamentous structures. In the latter joint it forms the *posterior annular ligament.* The *palmar fascia* occupies the middle and side of the hand, its central portion spreads over the heads of the metacarpal bones, where it divides into slips which are attached to the phalanges.

Fasciæ of the Lower Extremity.—As in the upper extremity, the *superficial fascia* of the lower contains between its layers the superficial vessels and nerves. At the groin these layers are separated by the lymphatic glands. The *deep fascia* of the thigh is called, from its great extent, *fascia lata*. It is strongly connected with the prominent points of bone around the hip, knee, and ankle joints. The sheath of the femoral vessels is a continuation of the abdominal fascia down the thigh. In this sheath is an interval between the vein and its inner wall, the upper opening of which is called the *femoral ring*. This ring is bounded in front by Poupart's ligament, behind by the os pubis, internally by Gimbernat's ligament, and externally by the femoral vein, and is closed only by a thin layer of areolar tissue, called *septum crurale*, which retains the lymphatic gland in position, and the peritoneum.

FEMORAL HERNIA.

When violent or long-continued pressure is made on the abdominal viscera, a portion of intestine may be forced through the femoral ring into the interval or space in the sheath of the femoral vessels, constituting *femoral hernia*. The protruding intestine pushes along the peritoneum and septum crurale. If the causes continue, the intestine will be forced forward through an opening, called *saphenous*, in the fascia lata, carrying along two additional coverings, the sheath of the femoral vessels, or fascia proper, and another investment, called the *cribriform fascia;* next curving upward over Poupart's ligament, the hernia becomes fixed beneath the superficial fascia and skin. Its direction being therefore *downward*, then *forward*, and then *upward*, the efforts to reduce it must be directed in the reverse order.

The *fascia of the leg* is thickened toward the ankle joint into narrow bands, which form the *annular ligaments*.

The *plantar fascia* forms strong layers, which invest the tendons and joints of the foot and toes.

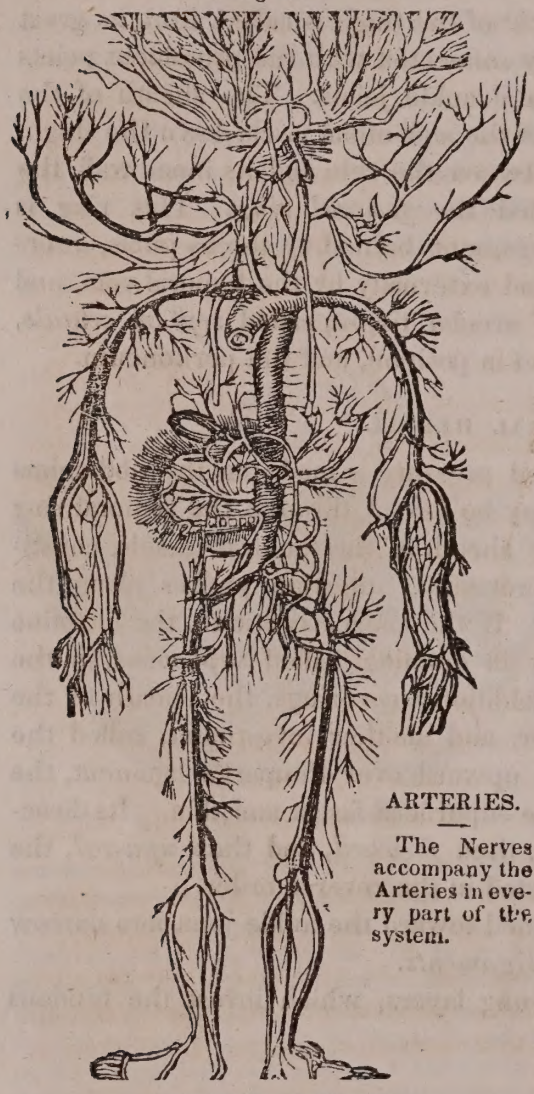
CHAPTER V.

OF THE ARTERIES—ANGEIOLOGY.

The arteries constitute that part of the circulating system which carries the blood *from* the heart to all parts of the body. They are dense, cylindrical tubes, which form they retain when emptied of

blood, and even after death, from which circumstance the ancients regarded them as air-vessels.*

Fig. 70.



ARTERIES.

The Nerves accompany the Arteries in every part of the system.

ARTERIAL SYSTEM.

The *aorta*, which proceeds from the left ventricle of the heart, and branches, contain the pure or arterial blood, and, with the veins which return this blood again to the heart, constitute the *greater* or *systemic circulation*. The *pulmonary* artery, which conveys the venous or impure blood to the lungs, with its corresponding veins, is called the *lesser* or *pulmonary* circulation.

Structure of Arteries.—Arteries are composed of three coats: the *external* is cellular, or areolo-fibrous; the *middle* is muscular, or, rather, a mixed tissue of elastic and contractile fibres; and the *internal* is nervous, or a serous membrane, throughout whose substance are ramified the nerves of organic life. The outer coat is firm and strong: the middle is thick and soft; and the internal thin and polished.

Distribution of Arteries.—All the arteries of the general system are branches of the aorta, which divide and subdivide to their final ramifications in the capillary system. From the aorta most of the branches pass off at right angles, which moderates the impetus of the blood; but in the extremities the branches leave the main artery at an acute angle, which favors the most rapid circulation. When an artery divides, the area of its branches is always greater than that of the sin

* The term angeiology has been applied to the vascular system; it includes the blood vessels, arteries, and veins, and the lymphatics.

gle trunk; and the combined area of the ultimate ramifications of all the arteries is vastly greater than that of the aortic trunk. This arrangement allows a more quiet motion of the vital current in the extreme vessels, where decomposition and recomposition of structures are effected. All the arteries are invested with a fibro-cellular sheath, which also contains their accompanying veins, and sometimes a nerve.

Intercommunication of Arteries.—In all parts of the body the arterial tubes communicate with each other by branches passing between, called *inosculations*, or *anastomoses*. These connections increase in frequency as the vessels diminish in size, so that their final distribution is a complete circle of inosculations. The advantage of this provision against obstructions which are most liable to occur in the smaller branches is obvious. When an artery is divided, or its cavity obliterated, the anastomosing branches above enlarge and make up the loss of blood by a collateral circulation. The arteries do not terminate directly in veins, but in an intermediate system, called the *capillary*, an extremely minute network of vessels and nerves, from which the veins arise.

THE SYSTEMIC ARTERIES.

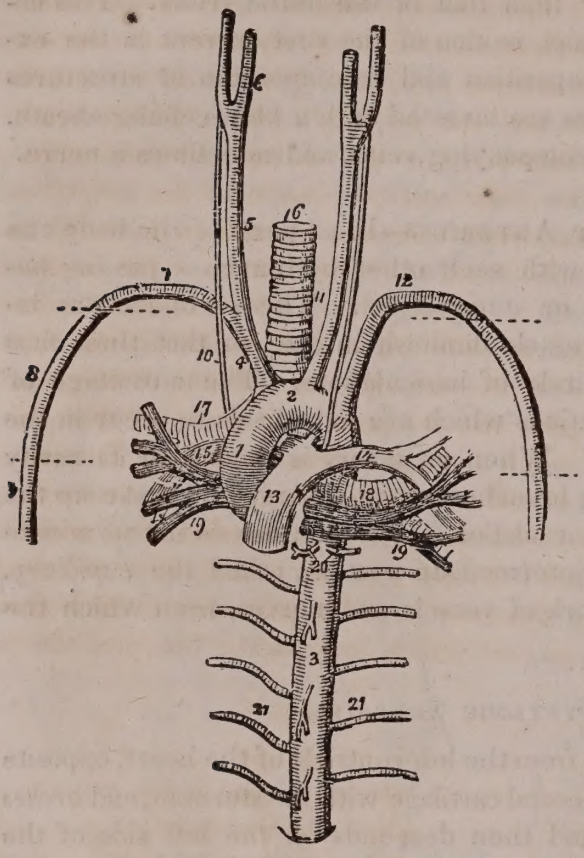
Aorta.—The *aorta* arises from the left ventricle of the heart, opposite the articulation of the fourth costal cartilage with the sternum, and *arches* backward and to the left, and then descends on the left side of the spine to the fourth lumbar vertebra. It is hence divided into *ascending*, *arch*, and *descending*, the descending portion being subdivided into *thoracic* and *abdominal*. At its commencement there are three dilatations, called its *sinus*, corresponding with the three *semilunar valves*.

The *coronary* arteries are the only branches given off by the ascending aorta; they arise just behind the semilunar valves, pass through the grooves between the auricles and ventricles, and are distributed to the substance of the heart.

Arteria Innominata.—The *arteria innominata* arises from the arch of the aorta, is an inch and a half in length, and ascends obliquely toward the right side in front of the trachea; behind the right sterno-clavicular joint it divides into the right carotid and right subclavian.

Common Carotid Arteries.—The *right* common carotid arises from the bifurcation of the innominata, and ascends the neck perpendicularly to the upper border of the thyroid cartilage, where it divides into the external and internal carotids. The *left* arises from the arch of the aorta, ascends the neck, and divides like the right.

Fig. 71.



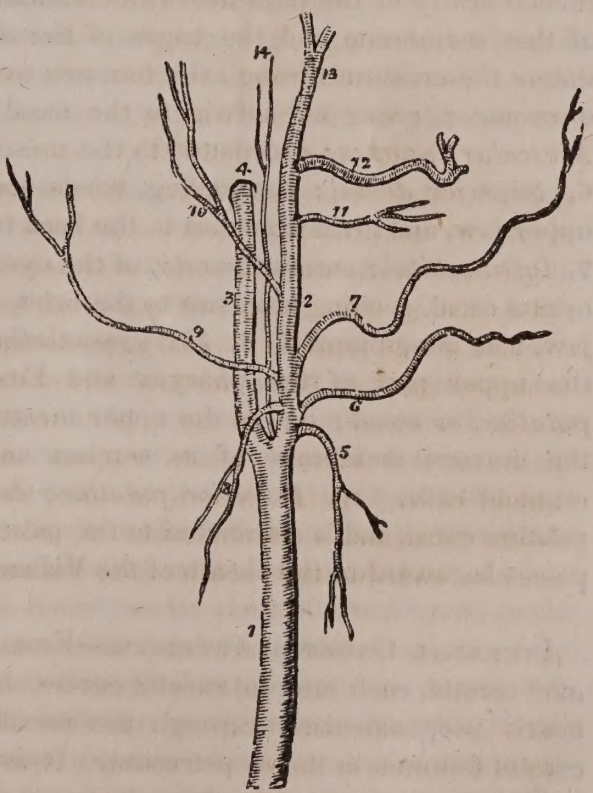
LARGE CARDIAC VESSELS.

Fig. 71 shows the relations of the large vessels proceeding from the root of the heart, that viscis being removed. 1. Ascending aorta. 2. Arch. 3. Thoracic aorta. 4. Innominata; this divides, at 5, into right carotid, which, at 6, subdivides into external and internal carotid; and 7, the right subclavian. 8. Axillary. 9. Brachial. 10. Right pneumogastric nerve. 11. Left carotid. 12. Left subclavian. 13. Pulmonary. 14. Left pulmonary. 15. Right pulmonary. 16. Trachea. 17. Right bronchus. 18. Left bronchus. 19, 19. Pulmonary veins. 20. Bronchial arteries. 21. Intercostal.

EXTERNAL CAROTIDS.—Each external carotid, passing through the deep portion of the parotid gland, ascends nearly perpendicularly to the space between the neck of the lower jaw and the meatus auditorius, where it divides into the temporal and internal maxillary. It gives off nine branches; the first three *anteriorly*, the next three *superiorly*, and the last three *posteriorly*. 1. *Superior thyroid;* curves downward to the thyroid gland, where it is distributed. It sends a *hyoid* branch to the muscles of the hyoid bone, and *superior* and *inferior laryngeal*, and *muscular* branches to the larynx. 2. *Linguinal;* ascends obliquely to the under surface of the tongue, running forward in a serpentine direction to its tip, where it is called the *ranine artery;* it gives off the *hyoid*, *dorsalis linguæ*, and *sublingual* branches. A branch of this latter branch is often divided in cutting the frænum linguæ in tongue-tied children. 3. *Facial;* this arises above the os hyoides, and descends obliquely to the submaxillary gland, where it is embedded; it then curves around the body of the lower jaw, ascends to the angle of the mouth, and thence to the angle of the eye, giving off, below the jaw, *inferior palatine*, *submaxillary*, *submental*, and *pterygoid* branches, and on the face the *masseteric*, *inferior labial inferior coronary superior coronary*, and *lateralis nasi* branches. 4. *Mastoid;* turns downward to be distributed to the sterno-mastoid

muscle and lymphatic glands of the neck. 5. *Occipital* passes backward a little below the facial, forms a loop with the hypo-glossal nerve, and is distributed upon the occiput, anastomosing freely with the opposite occipital, the temporal, and auricular arteries. It gives off the *inferior meningeal* to the dura mater, and the *princeps cervicis*, a large branch which descends the neck between the complexus and semi-spinalis colli, and inosculates with the deep cervical branch of the subclavian. This branch establishes an important collateral circulation between the branches of the carotid and subclavian, after the ligature of the common carotid. 6. *Posterior auricular; arises* above the level of the digastric and stylo-hyoid muscles, and ascends below the parotid gland, to be distributed, by two branches, to the external ear and side of the head, anastomosing with the occipital and temporal. It sends off the *stylo-mastoid* branch to the tympanum and aquæductus Fallopii. The anterior arteries of the ear are branches of the temporal. 7. *Ascending pharyngeal; arises* near the external carotid bifurcation, and ascends to the base of the skull, where it divides into two branches—*meningeal*, which, passing through the foramen lacerum posterius, is distributed to the dura mater, and *pharyngeal*, which supplies the pharynx, tonsils, and Eustachian tube. 8. *Parotideans;* four or five branches distributed to the parotid gland and adjacent integuments. 9. *Transversalis facei; arises* from the trunk within the parotid gland, crosses the masseter muscle, and is distributed to the temporo-maxillary articulation, and muscles and integuments of the side of the face, inosculating with the facial and infra-orbital.

Fig. 72.



CAROTIDS AND BRANCHES

Fig. 72 is a plan of the common carotids, with the branches of the external. 1. Common carotid. 2. External carotid. 3. Internal carotid. 4. Carotid foramen in the petrous portion of the tempora bone. 5. Superior thyroid. 6 Lingual. 7. Facial. 8. Mastoid 9. Occipital. 10. Posterior auricular. 11. Transverse facial. 12. Internal maxillary. 13. Temporal 14. Ascending pharyngeal

The Temporal Artery.—This terminal branch of the externa. carotid ascends over the root of the zygoma, where it divides into two branches: 1. *Anterior temporal;* distributed over the front of the temple and arch of the skull, anastomosing with its fellow, the frontal and supra-orbital. 2. *Posterior temporal;* curves upward and backward, inosculating with its fellow, the occipital and posterior auricular It sends off three branches—the *orbitar* to the palpebral arteries, the *middle temporal* to the temporal muscle, and the *anterior auricular* to the ear.

The Internal Maxillary Artery.—The other terminal branch of the external carotid passes inward behind the neck of the lower jaw to the deep structures of the face. Its branches are: 1. *Tympanitic*, distributed to and around the drum of the ear, passing through the glenoid fissure. 2. *Inferior dental;* descends to the dental foramen, and enters the canal of the lower jaw with the dental nerve. It supplies the teeth of the lower jaw, sending small branches along the canals in their roots. A branch also emerges at the mental foramen and anastomoses with the facial arteries. 3. *Meningea media;* passes through the foramen spinosum of the sphenoid bone, and becomes the middle artery of the dura mater, its branches ramifying through a part of that membrane and the bones of the skull. 4. *Meningea parva:* enters the cranium through the foramen ovale, and is distributed to the dura mater, giving off a twig to the nasal fossæ and soft palate. 5. *Muscular branches;* distributed to the muscles of the maxillary region. 6. *Superior dental;* descending, winds around the tuberosity of the upper jaw, and gives branches to the back teeth, gums, and the antrum 7. *Infra-orbital;* enters the orbit of the eye, and passes along the infra-orbital canal, sending branches to the orbit, antrum, teeth of the upper jaw, and integuments. 8. *Pterygo-palatine;* a small branch sent to the upper part of the pharynx and Eustachian tube 9. *Spheno-palatine*, or *nasal;* enters the upper meatus of the nose, and supplies the mucous membrane of its septum and walls, and sphenoid and ethmoid cells. 10. *Posterior palatine;* descends along the posterior palatine canal, and is distributed to the palate. A branch called *Vidian* passes backward to the sheath of the Vidian nerve and Eustachian tube

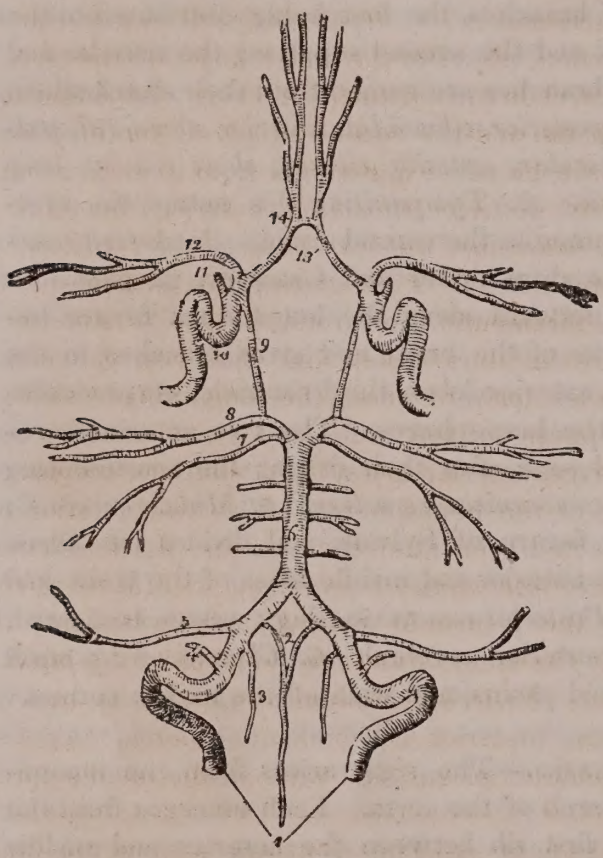
Internal Carotid Arteries.—From the bifurcation of the common carotid, each internal carotid curves slightly *outward*, then ascends nearly perpendicularly through the maxillo-pharyngeal space, to the carotid foramen in the os petrosum. It next passes *inward* along the carotid canal, *forward* by the sella turcica and then *upward*, piercing

the dura mater, and dividing into three terminal branches. These remarkable angular curves greatly diminish the force of blood thrown into the substance of the brain. The cerebral portion of the artery gives off the following branches: 1. *Ophthalmic;* it enters the orbit through the optic foramen, passes to the inner angle of the eye, and divides into two groups of branches, the first being distributed to the orbit and surrounding parts, and the second supplying the muscles and globe of the eye. These branches are named from their distribution: *Lachrymal*, *supra-orbital*, *posterior ethmoidal*, *anterior ethmoidal*, *palpebral*, *frontal*, *nasal*, *muscular*, *anterior ciliary*, *short ciliary*, *long ciliary*, and *centralis retinæ*. 2. *Tympanitic;* this enters the tympanum through a small foramen in the carotid canal. 3. *Anterior meningeal;* distributed to the dura mater and Casserian ganglion. 4. *Anterior cerebral;* passes forward along the longitudinal fissure between the two hemispheres of the brain, and gives branches to the optic and olfactory nerves, anterior lobes, third ventricle, corpus callosum, and inner surface of the hemispheres. The two anterior cerebral arteries are connected soon after their origin; the anastomosing trunk is called the *anterior communicating artery*. 4. *Middle cerebral;* passes outward along the fissure of Sylvius, and divides into three branches, which supply the anterior and middle lobes of the brain, and the corpus striatum. 5. *Posterior communicating;* passes backward, and inosculates with the posterior cerebral. 6. *Choroidean;* a small branch sent off to the choroid plexus, and walls off the middle cornua.

The Subclavian Arteries.—The *right* arises from the innominata, and the *left* from the arch of the aorta. Each emerges from the chest by passing over the first rib between the anterior and middle scaleni muscles. Its primary branches are five, most of which are given off before it arrives at the upper rib. The first three *ascend;* the remaining two *descend*. 1. *Vertebral;* this is its largest branch: it passes through the foramina in the transverse processes of all the cervical vertebræ, except the lower, and enters the skull through the foramen magnum of the occipitis. At the lower border of the pons Varolii the two arteries unite to form the *basilir*. The vertebral and basilir arteries send off the following secondary branches: *Lateral spinal*, to the spinal cord and membranes; *posterior meningeal*, to the dura mater, cerebellar fossæ, and falx cerebelli; *anterior spinal*, to the spinal cord; *posterior spinal*, to the spinal cord; *inferior cerebellar*, to the lower surface of the cerebellum; *transverse*, to the pons Varolii and adjacent parts of the brain; *superior cerebellar*, to the upper surface of the cerebellum; and *posterior cerebral*, to the posterior lobes

of the cerebrum. A remarkable connection of arteries at the base of the brain, formed by the interior communicating branch, anterior cerebrals, and internal carotids in front, and by the posterior communicating, posterior cerebrals, and basilir behind, is called the circle of Willis.

Fig 73.



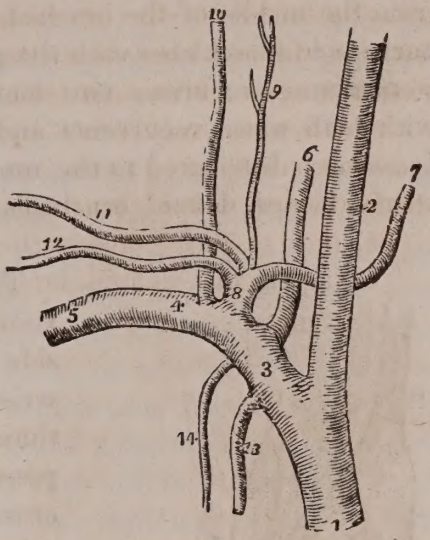
CIRCLE OF WILLIS.

Fig. 73 exhibits the communication of the arteries constituting the circle of Willis. 1. Vertebral arteries. 2. The two anterior spinal branches united to form a single vessel. 3. One of the posterior spinal arteries. 4. Posterior meningeal. 5. Inferior cerebellar. 6. Basilir, giving off transverse branches to either side. 7. Superior cerebellar. 8. Posterior cerebral. 9. Posterior communicating branch of the internal carotid. 10. Internal carotid, showing its curvature within the skull. 11. Ophthalmic, divided across. 12. Middle cerebral. 13. Anterior cerebral, connected by, 14. The anterior communicating artery.

2. *Thyroid axis;* this is a short trunk, dividing soon after its origin into four branches: *Inferior thyroid*, distributed to the thyroid gland, and sending twigs to the trachea, larynx, and œsophagus; *supra-scapular*, distributed to the muscles on the upper surface of the shoulder blade, sending a twig to the trapezius; *posterior scapular*, passing across the neck, supplying the muscles behind the scapula, and giving branches to those of the neck; with the branches of the external carotid, subclavian, and axillary, it establishes an important anastomotic communication; *superficial cervical*, distributed to the deep muscles and glands of the neck, and sending twigs through the intervertebral foramina to the spinal cord and membranes. 3. *Profunda cervicis;* passes backward below the lower cervical vertebra, and then ascends the back of the neck, inosculating with branches of the occipital and scapular. 4. *Superior intercostal;* descends behind the pleura upon the necks of the first two ribs, supplying their spaces and inosculating with the first aortic intercostal.

Fig. 74 shows the branches of the right subclavian. 1. Innominata. 2. Right carotid. 3. First portion of the subclavian. 4. Its second portion. 5. Its third portion. 6. Vertebral artery. 7. Inferior thyroid. 8. Thyroid axis. 9. Superficialis cervicis. 10. Profunda cervicis. 11. Posterior scapular. 12. Supra-scapular. 13. Internal mammary. 14. Superior intercostal.

Fig. 74.



SUBCLAVIAN BRANCHES.

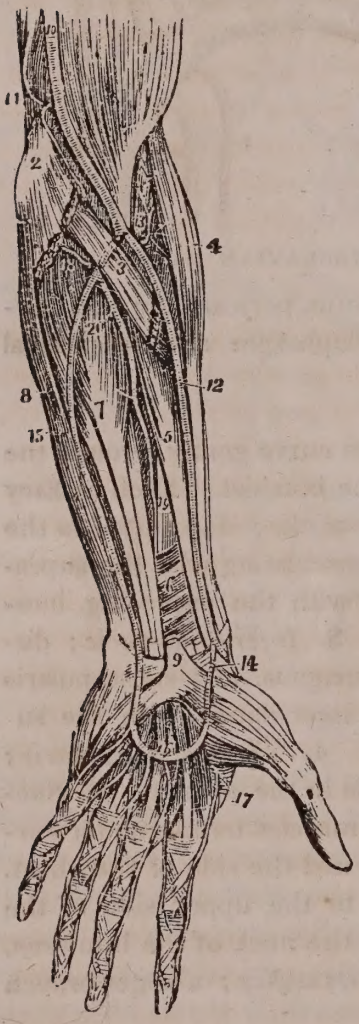
5. *Internal mammary;* descends by the side of the sternum to the diaphragm, where it enters the sheath of the rectus, and inosculates with the epigastric; it sends off the following branches: *Anterior intercostal*, to the front intercostal muscles; *mammary*, to the breasts; *comes nervi phrenica*, which accompanies the phrenic nerve; *mediastinal* and *pericardiac*, to the mediastinum, pericardium, and thymus gland; and *musculo-phrenic*, to the diaphragm and intercostal spaces.

The Axillary Arteries.—The axillaries curve gently through the middle of the armpit, where they become the brachial. Each axillary gives off seven branches: 1. *Thoracica acromialis;* distributed to the pectoral muscles and mammary gland, and inosculating with the supra-scapular. 2. *Superior thoracic;* distributed with the preceding, inosculating with the intercostal and mammary. 3. *Inferior thoracic;* distributed to the pectoralis minor, serratus magnus, and subscapularis muscles, and axillary and mammary glands, inosculating with the superior thoracic, intercostal, and mammary. 4. *Thoracica axillaris;* distributed to the plexus of nerves and glands in the armpit. 5. *Subscapular;* the largest branch; supplies the muscles on the under surface and lower border of the shoulder blade, and the side of the chest. A branch, called *dorsalis scapulæ*, is sent to the upper side of the scapula. 6. *Circumflex;* these wind around the neck of the humerus, and supply the shoulder joint. 7. *Posterior circumflex;* a larger branch distributed to the joint and deltoid muscle.

Brachial Arteries.—Each brachial artery extends down the arm, from the lower border of the latissimus dorsi to the elbow, where it divides into the radial and ulnar. Along the arm it gives off four branches: 1. *Superior profunda;* winds around the humerus between the triceps and bone and inosculates with the radial recurrent; t sends

the *posterior articular* to the elbow joint. 2. *Inferior profunda;* arises from the middle of the brachial, descends to the elbow with the ulnar nerve, and inosculates with the posterior ulnar recurrent. 3. *Anastomotica magna;* arises two inches above the elbow, and inosculates with both ulnar recurrents and the inferior profunda. 4. *Muscular branches;* distributed to the muscles along its course, viz., coraco-brachialis, biceps, deltoid, brachialis anticus, and triceps

Fig. 75.



ARTERIES OF FORE-ARM.

THE RADIAL ARTERY.—The radial division of the brachial runs along the radial side of the fore-arm from the elbow to the wrist, where it turns around the base of the thumb beneath its extensor tendons, and passes into the palm of the hand. It then crosses the metacarpal bones to the ulnar side, forming the *deep palmar arch*, and terminates by inosculating with the superficial palmar arch. This is the artery which, from its superficial position above the wrist and base of the thumb, is selected for "examining the pulse." Its branches are: 1. To the fore-arm; the *recurrent radial* and *muscular*. 2. To the wrist; *superficialis volæ*, *carpalis anterior*, *carpalis posterior*, *metacarpalis*, and *dorsales pollicis*. 3. To the hand; *princeps pollicis*, *radialis indicis*, *interosseæ*, and *perforantes*, distributed as their names import.

The arteries of the fore-arm are shown in Fig 75. 1. Biceps muscle. 2. Inner condyle of the humerus. 3. Pronator radii teres. 4. Supinator longus. 5. Flexor longus pollicis. 6. Pronator quadratus. 7 Flexor profundus digitorum. 8. Flexor carpi ulnaris. 9. Annular ligament. 10. Brachial artery. 11. Anastomotica magna. 12. Radial. 13. Radial recurrent 14. Superficialis volæ. 15. Ulnar. 16. Its superficial palmar arch. 17. Magna pollicis and radialis. 18 Posterior ulnar recurrent. 19. Anterior interosseous 20. Posterior interosseous.

THE ULNAR ARTERY.—The ulnar division of the brachial crosses the arm obliquely, then runs down the ulnar side to the wrist, crossing the annular ligament, forming the superficial palmar arch, and terminating by inosculating with the superficial volæ. Its branches are: 1.

To the fore-arm; *anterior* and *posterior recurrent*, *anterior* and *posterior interosseous*, and *muscular*. 2. To the wrist; *carpialis anterior* and *posterior*. 3. To the hand; *digitales*, distributed as their names import.

The Thoracic Aorta.—In the cavity of the chest the aorta gives off three groups of branches: 1. *Bronchial;* four in number, distributed to the bronchial glands and tubes; they also send branches to the œsophagus, pericardium, and left auricle. They are the nutritive vessels of the lungs. 2. *Œsophageal;* numerous small branches distributed to the œsophagus, and making a chain of anastomoses along its course. 3. *Intercostal;* nine on each side, arising from the posterior part of the aorta, and sent to the nine lower intercostal spaces, where each branch gives off a *dorsal branch;* thus dividing into *spinal* and *muscular* branches, which supply the spina cord, and muscles and integuments of the back.

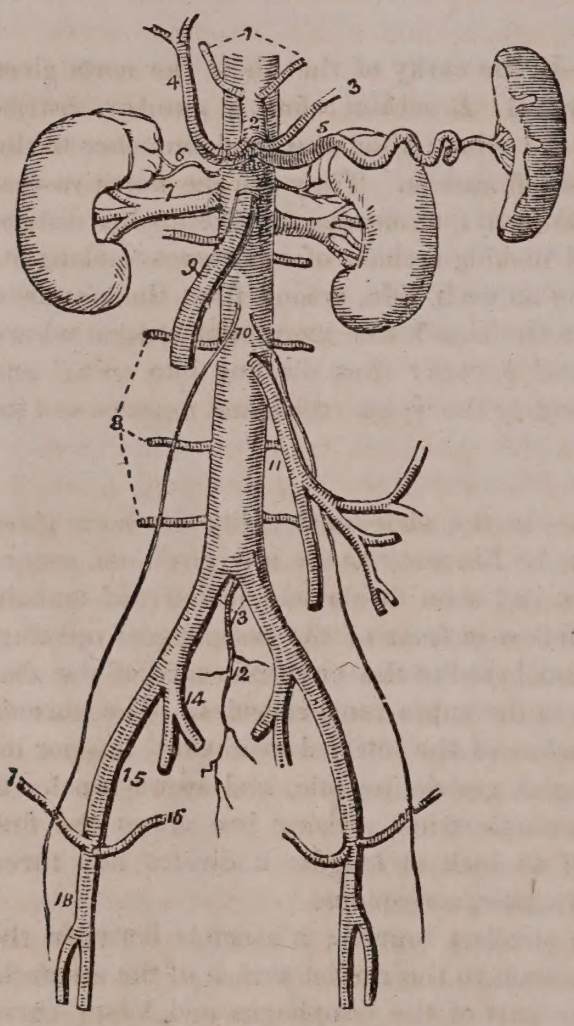
The Abdominal Aorta.—In the abdominal cavity the aorta gives off nine primary branches: 1. *Phrenic;* these are given off immediately below the diaphragm, and soon divide into an *internal* branch, which inosculates with its fellow in front of the œsophageal opening, and an *external*, which is distributed to the circumference of the diaphragm, and sends branches to the supra-renal capsules. The phrenic arteries inosculate with branches of the internal mammary, inferior intercostal, epigastric, œsophageal, gastric, hepatic, and supra-renal. 2. *The Cœliac axis;* this is a single trunk, arising just above the first lumbar vertebræ, about half an inch in length; it divides into three large branches, the gastric, hepatic, and splenic.

The *Gastric artery* is the smallest branch; it ascends between the two layers of the lesser omentum to the cardiac orifice of the stomach, to be distributed to the lower part of the œsophagus and lesser curve of the stomach. It inosculates with branches of the hepatic and splenic.

The *Hepatic* branch ascends along the right border of the lesser omentum to the liver, where it divides into right and left branches these are distributed along the portal canals to the right and left lobes. It sends a *pyloric* branch to the lesser curve of the stomach and duodenum; the *gastro-duodenalis*, dividing into the *gastro-epiploica dextra* and *pancreatico-duodenalis*, which are distributed to the greater curve of the stomach, pancreas, and duodenum; and the *cystic*, which is distributed to the gall-bladder. The gastric, pyloric, and splenic branches

inosculate with each other, and with branches of the pancreas, duodenum, jejunum, and mesentery.

Fig. 76.



ABDOMINAL BRANCHES.

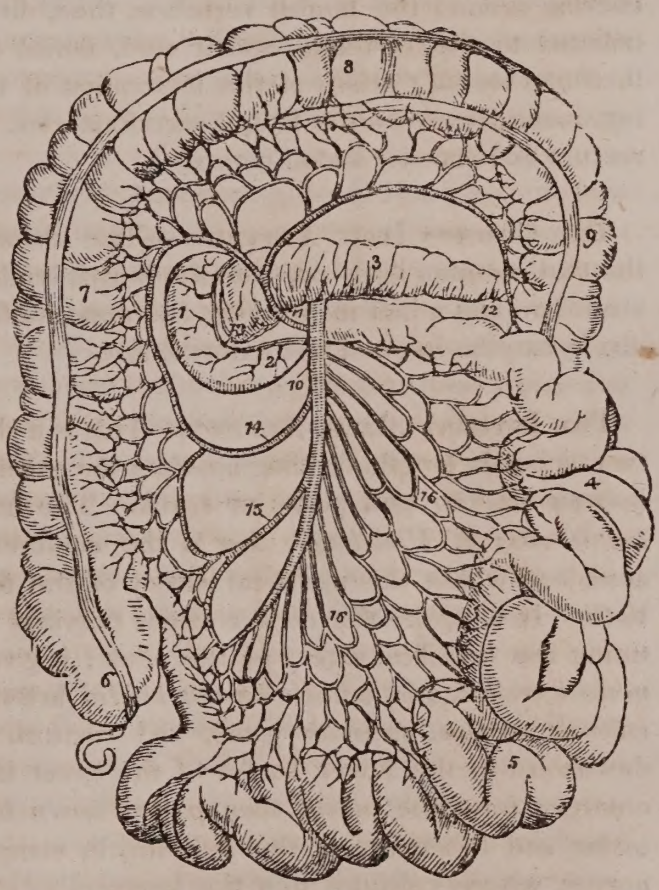
The abdominal aorta is shown in Fig. 76, with its branches. 1. Phrenic arteries. 2. Cœliac axis. 3. Gastric artery. 4. Hepatic. 5. Splenic. 6. Right supra-renal. 7 Right renal. 8. Lumbar. 9. Superior mesenteric. 10. The two spermatic. 11. Inferior mesenteric. 12. Sacra media. 13. Common iliacs. 14. Right internal iliac. 15 External iliac. 16. Epigastric. 17 Circumflexa ilii. 18. Femoral.

The *Splenic* artery is the largest branch of the cœliac axis; it passes horizontally to the left along the upper border of the pancreas, and enters the spleen by five or six divisions, which are distributed to its structure. In its course it is tortuous and serpentine, frequently making a complete turn upon itself. It is accompanied by the splenic vein, and splenic plexus of nerves. It sends off numerous small branches, *pancreaticæ parvæ*, to the pancreas; the largest follows the pancreatic duct, and is called *pancreatica magna;* several branches, *vasa brevia*, to the great end of the stomach, to which they are distributed, inosculating with branches of the gastric; and the *gastro-epiploica sinistra*, which appears to be the continuation of the splenic artery; it passes from left to right along the great curve of the stomach, and inosculates with the gastro-epiploica dextra; its distribution is to the curve of the stomach and great omentum.

3. *Superior mesenteric;* arises behind the pancreas, and descends within the layers of the mesentery to the right iliac fossa. Its branches are: *Vasa intestini tenuis;* fifteen or twenty branches, distributed to the small intestines. Between the layers of the mesentery the larger

branches inosculate so as to form series of arches; from these secondary arches are similarly formed, and from the latter a third series, from which branches are distributed to the intestinal coats. Sometimes a fourth or even fifth series of arches is produced. *Ileo-colic;* descends to the right iliac fossa, where it divides into branches, which form arches, and are finally distributed to the ilium, cæcum, and colon. *Colica dextra;* forms arches, from which branches are distributed to the ascending colon. *Colica media;* distributed, like the preceding, to the transverse part of the colon. All the branches of the superior mesenteric inosculate freely with each other.

Fig. 77.



MESENTERIC DISTRIBUTION.

Fig. 77 shows the course and distribution of the superior mesenteric artery. 1. Duodenum. 2. Its transverse portion. 3. Pancreas. 4. Jejunum. 5. Ileum. 6. Cæcum, with its vermiform appendix. 7. Ascending colon. 8. Its transverse portion. 9. Commencement of the descending colon. 10. Superior mesenteric artery. 11. Colica media. 12. The branch inosculating with the colica sinistra. 13. Branch of the superior mesenteric inosculating with the pancreatico-duodenalis. 14. Colica dextra. 15. Ileo-colica. 16, 16. Branches from the convexity of the superior mesenteric to the small intestines.

4. *Spermatic;* the spermatic arteries are two small vessels arising from the aorta below the mesenteric, and, passing obliquely outward, accompany the ureters along the front of the psoas muscle to the border of the pelvis. Each spermatic artery is then directed outward to the internal abdominal ring, following the spermatic cord, with its corresponding veins and plexus of nerves, through the scrotum to the testicle, to which it is distributed. In the female they descend into the pelvis, and pass between two layers of the broad ligaments of

the uterus, to be distributed to the ovaries, Fallopian tubes, and round ligaments, inosculating with the uterine arteries. 5. *Inferior mesenteric;* arises two inches below the superior mesenteric, and descends to the left iliac fossa, when it divides into the *colica sinistra*, which is distributed to the descending colon; the *sigmoidex*, several branches sent to the sigmoid flexure of the colon; and the *superior hæmorrhoidal*, which descends to the rectum, and is there distributed. 6. *Supra-renal;* two small vessels sent to the supra-renal capsules. 7. *Renal*, two large trunks given off immediately below the superior mesenteric; they divide into several large branches, which are minutely ramified in the substance of the kidneys. 8. *Lumbar;* four or five branches curving around the lumbar vertebræ, then, dividing into branches, distributed to the vertebræ, spinal cord, dorsal and abdominal muscles. 9. *Sacra media;* arises at the bifurcation of the aorta, and, descending, inosculates with the lateral sacral arteries, sending branches to the rectum and anterior sacral nerves.

The Common Iliac Arteries.—The abdominal aorta divides into the two common iliacs opposite the fourth lumbar vertebra. They are about two and a half inches long, and opposite the sacro-iliac symphasis divide into the internal and external iliac.

The Internal Iliac Artery.—This is a short trunk, from one to two inches in length, dividing opposite the great sacro-ischiatic foramen into an anterior and posterior trunk. The branches of the *anterior trunk* are: 1. *Umbilical;* this is the commencement of the fibrous cord, into which the umbilical artery of the fœtus is converted after birth. In after life the cord remains pervious a short distance, constituting the umbilical artery of the adult; it gives off the *superior* and *middle vesical*, and *middle hæmorrhoidal* arteries to the bladder, vesiculæ seminales, prostate gland, and rectum. 2. *Ischiatic;* presses downward to the lower border of the great ischiatic notch, where it emerges from the pelvis, then passes down between the trochanter major and tuberosity of the ischium, in company with the ischiatic nerves, where it divides into the *hæmorrhoidal*, distributed to the rectum; *inferior vesical*, to the base and neck of the bladder, vesiculæ seminales, and prostate gland; *coccygeal*, to the integuments and muscles around the anus and coccyx; *inferior gluteal*, to the gluteus maximus; *comes nervi ischiatici*, to the lower part of the thigh; and *muscular* branches, which supply the posterior part of the hip and thigh. 2. *Internal pudic;* passes down in front of the ischiatic, emerges from the pelvis through the great sacro-ischiatic foramen, crosses the spine

of the ischium, and re-enters the pelvis through the lesser sacro-ischiatic foramen; it then crosses the internal obturator muscle to the ramus of the ischium, ascends the ramus, and at the symphysis enters the deep perineal fascia, finally reaching the dorsum of the penis, along which it runs, much diminished in size, supplying that organ under the name of *dorsalis penis*. Within the pelvis it sends branches to the bladder, vesiculæ seminales, prostate gland, and rectum. Externally to the pelvis it gives off the *external hæmorrhoidal* to the muscles and integuments of the anus and perineum; *superficialis perinei*, to the scrotum and perineum; *bulbosa*, to the corpus spongiosum of the penis; *corposis cavernosi*, to the corpus cavernosum; and *dorsal*, distributed to the body of the penis.

In the female the internal pudic is smaller; its distribution is the same in principle to the corresponding organs. The *uterine* and *vaginal* arteries are derived from the internal iliac, umbilical, internal pudic, and ischiatic arteries.

The branches of the posterior trunk are: 1. *Ileo-lumbar;* distributed to the abdominal muscles. 2. *Obturator;* this passes from the pelvis through the obturator foramen, and divides into *internal* and *external* branches, which are distributed to the muscles around the hip joint. 3. *Lateral sacral;* two in number; the *superior* passes through the posterior sacral foramen, and is distributed to the spinal canal and sacral integuments; the *inferior* supplies the sacral nerves. 4. *Gluteal;* this is the continuation of the main trunk; it passes through the great sacro-ischiatic foramen, and divides into a *superficial* branch, which ramifies in the gluteus maximus and adjacent integuments; a *deep superior* branch, which inosculates with the circumflex arteries; and *deep inferior* branches, which are sent to the gluteus minimus and capsule of the hip joint.

The External Iliac.—The external iliac of each side passes obliquely downward along the inner border of the psoas muscle, from opposite the sacro-iliac symphysis to the femoral arch, where it becomes the femoral artery. It is surrounded by lymphatic vessels and glands throughout its whole course. Its branches are: 1. *Epigastric;* arises near Poupart's ligament, passes forward between the peritoneum and transversalis fascia, ascends obliquely to the sheath of the rectus, which it enters and passes upward behind that muscle. It is distributed to the rectus, inosculating in its substance with the internal mammary. It sends a *cremasteric* branch to the muscle of that name, and inosculating branches to the obturator artery. The epigastric artery forms the prominence of the peritoneum, which divides the iliac fossa

into internal and external portions, from the former of which direct inguinal hernia issues, and from the latter oblique inguinal hernia. 2. *Circumflexa ilii;* arises nearly opposite the epigastric. It is distributed to the abdominal muscles, inosculating with the inferior intercostal and lumbar.

The Femoral Artery.—After emerging from Poupart's ligament the external iliac enters the thigh, and takes the name of *femoral.* It passes down the inner side of the thigh midway between the anterior superior spine of the ilium and the symphysis pubis, to the opening in the adductor magnus, which is about two thirds the distance to the knee, where it takes the name of popliteal. Its branches are: 1 *Superficial circumflexa ilii;* to the integuments of the groin and inguinal glands. 2. *Superficial epigastric;* distributes branches to the groin, and ascends toward the umbilicus, to inosculate with branches of the epigastric and internal mammary. 3. *Superficial external pudic;* to the penis and scrotum in the male, and the labia in the female. 4 *Deep external pudic;* to the scrotal integuments and perineum. 5. *Profunda;* to the flexor muscle on the back of the leg. This artery which arises two inches below Poupart's ligament, divides into the *external circumflex,* which supplies the muscles on the front and outer side of the thigh, and inosculates with the gluteal and ischiatic; the *internal circumflex,* which winds around the inner side of the neck of the femur, supplying the muscles on the upper and inner side of the thigh, anastomosing with the adjacent vessels; and the *perforating arteries;* three branches, distributed to the posterior, anterior, and flexor muscles of the thigh, and inosculating freely with the surrounding branches of other arteries. These anastomoses maintain the collateral circulation of the limb after ligature of the femoral artery. 6. *Muscular;* given off to all the surrounding muscles. 7. *Anastomotica magna;* this runs along the tendon of the adductor magnus to the inner condyle, and inosculates with the arteries around the knee joint; some of the branches are distributed to the vastus internus.

The Popliteal Artery.— This continuation of the femoral passes obliquely outward to the lower border of the popliteal muscle, where it divides into the anterior and posterior tibial. Its branches are: 1 *Superior articular;* two branches, *external* and *internal,* which wind around the femur, supplying the knee joint and lower part of the femur, anastomosing with each other and the adjacent arteries. 2. *Azygos articular;* one or more sent to the interior of the synovial membrane. 3 *Inferior articular;* two branches, *external* and *internal*

which wind around the head of the tibia, supply the knee joint, heads of the tibia and fibula, and anastomose with each other and the adjacent arteries. 4. *Crural;* two large muscular branches, distributed to the two heads of the gastrocnemius.

The Anterior Tibial Artery.—This runs down the front aspect of the leg to the ankle joint, where it becomes the dorsalis pedis. Its branches are: 1. *Recurrent;* distributed to the knee joint, and anastomosing with the articular. 2. *Muscular;* numerous branches distributed to the anterior tibial region. 3. *Malleolar;* two branches, *external* and *internal*, distributed to the ankle joint, and anastomosing extensively with adjacent arteries.

The Dorsalis Pedis.—This continuation of the anterior tibial runs forward along the tibial side of the upper surface of the foot, from the ankle to the base of the metatarsal bone of the great toe, where, after sending off the *tarsea* branches to the tarsal articulations, and the *metatarsea*, which form an arch across the base of the foot and bones, and also giving off the *interosseæ*, which are distributed to the dorsal interossei muscles and toes, it divides into the *dorsalis pollicis*, distributed to the great and second toes, and the *communicating*, which passes to the sole of the foot, inosculating with the external plantar.

The Posterior Tibial Artery.—This division of the popliteal passes obliquely down the tibial side of the leg to the concavity of the os calcis, where it divides into the internal and external plantar. Its branches are: 1. *Peroneal;* a large branch given off two inches below the lower border of the popliteal muscle; it runs downward along the inner border of the fibula to its lower third, where it divides into an *anterior* branch, distributed around the outer malleolus, and a *posterior*, to the tarsus. 2. *Nutritious;* to the nutritive canal of the tibia. 3. *Muscular;* numerous branches sent to the deep muscles of the leg. A *recurrent* branch passes up and anastomoses with the articular arteries. 4. *Internal calcanean;* several branches sent to the os calcis and integuments, and anastomosing with the neighboring arteries.

The Plantar Arteries.—The *internal* proceeds from the bifurcation of the posterior tibial, along the inner border of the foot, supplying that part and the great toe. The *external*, the largest division, passes outward to the fifth metatarsal space, then turns horizontally inward between the layers of muscles to the first metatarsal space, where it inosculates with the communicating branch of the dorsalis

pedis. It sends off branches, named after their manner of distribution, *muscular*, *articular*, *digital*, *anterior* and *posterior perforating*, which supply the various structures and parts of the foot, and form numerous inosculating connections with each other

THE PULMONARY ARTERY.

The pulmonary artery arises from the left side of the right ventricle in front of the origin of the aorta; it ascends obliquely to the under surface of the aorta, where it divides into the right and left pulmonary. In its course upward and backward it crosses the commencement of the aorta, to which it is connected by a thick, impervious cord, the remains of the ductus arteriosus.

The RIGHT PULMONARY passes beneath the arch and behind the ascending aorta to the root of the lungs, where it divides into three branches, which are distributed to the three lobes of the right lung.

The LEFT PULMONARY, the largest division, passes in front of the descending aorta to the root of the left lung, to which it is distributed.

These arteries divide and subdivide in the substance of the lungs, and finally terminate in a network of capillary vessels around the air cells and intercellular passages.

CHAPTER VI.

OF THE VEINS—ANGEIOLOGY.

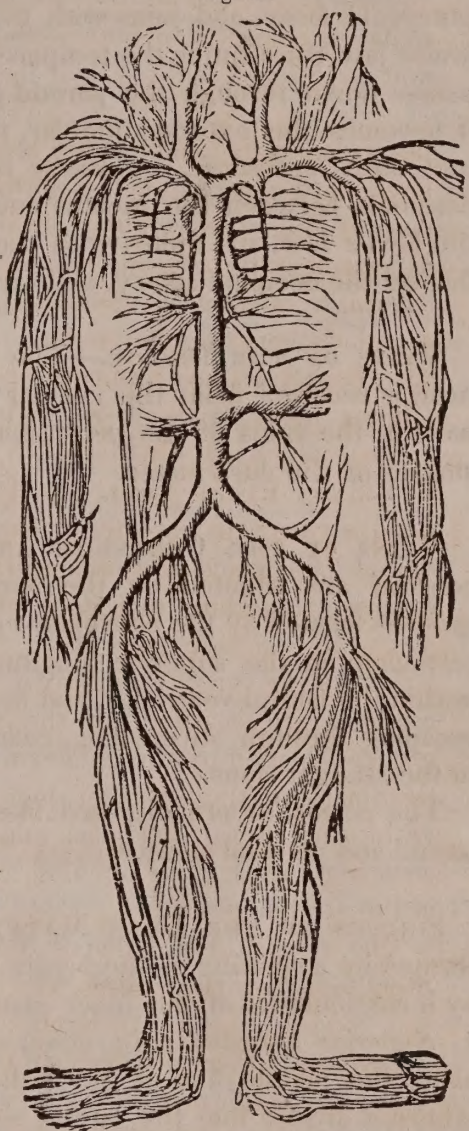
THE veins are the vessels which return the blood to the heart, after it has been circulated through the various structures of the body by the arteries. They are thinner than the arteries, and collapse and flatten on becoming empty.

In the systemic circulation the veins convey the dark-colored blood from the capillaries to the right auricle of the heart. The veins of the pulmonary circulation correspond to the arteries of the systemic circulation, as they convey the pure red blood from the capillaries of the lungs to the left auricle.

Veins originate by minute radicles in all the textures of the body, and converge to larger trunks, the sum of the radicles being larger than that of the main trunk; hence the blood, in returning to the heart, passes from a larger to a smaller channel, which increases its rapidity of motion.

Structure of Veins.—Like the arteries, the veins have three coats. The *external* is cellular, or areolar; the *middle* is fibrous, or muscular; and the *internal* is nervo-serous. The *middle* coat consists of an outer layer of circular fibres, and an inner layer of longitudinal organic muscular fibres. The inner coat is probably a continuation of the inner coats of arteries. The differences between the structures of arteries and veins is the thinness and inelasticity of the veins, and the existence of valves in them. These valves are generally semilunar fibrous flaps, arranged in pairs, one on each side of the vessel; sometimes, however, there is a single spiral flap, and occasionally three. The free border of the valvular flaps is concave, and directed forward, allowing a free current toward the heart, but preventing a retrograde motion. The valves are most numerous in the veins of the extremities; they are generally absent in very small veins, in the portal and cerebral veins, and those of the viscera; they are also absent in the large trunks, as the cavæ, azygos, innominata, and iliac.

Fig. 78.



THE VENOUS SYSTEM.

Veins are divided into *superficial*, *deep*, and *sinuses*. The *sinuses* are excavations in the structure of an organ, and lined by the internal coat of the veins. The principal are those of the dura mater, the diploe, the canalous structure of bones, and the uterus.

Veins of the Head.—The venous blood from the face and exterior of the head is principally collected by veins which accompany the arteries, and have the same names. The principal trunks are: 1 *Facial;* descends along the middle of the forehead, passes downward by the side of the root of the nose, and continues beneath the zygo-

matic muscles, receiving the *supra-orbital*, *nasal*, *ophthalmic*, *alveolar* and *palpebral* branches, and finally terminating in the internal jugular 2. *Internal maxillary;* receives the branches from the zygomatic and pterygoid fossæ, and joins with the temporal behind the neck of the lower jaw, constituting the temporo-maxillary. 2. *Temporo-maxillary*, passes down through the parotid gland, at the lower border of which it becomes the external jugular, receiving in its course the *anterior auricular*, *masseteric*, *transverse facial*, and *parotid*. 3. *Temporal;* descends between the meatus auditorius externus and the condyle of the lower jaw, and unites with the internal maxillary. 4. *Occipital;* follows the occipital artery, and terminates in the internal jugular.

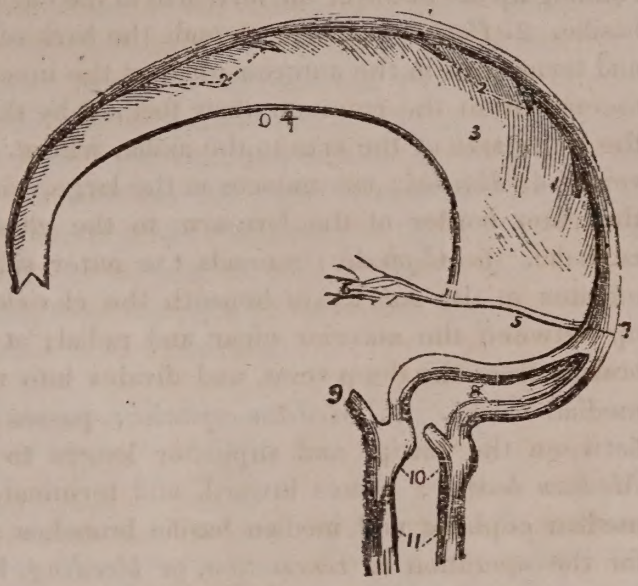
Veins of the Diploe.—The venous blood of the bones of the head is received from the cellular capillaries, which terminate externally in the veins of the pericranium and internally in the veins and sinuses of the dura mater.

Veins of the Cerebrum and Cerebellum.—The *superficial cerebral* are situated on the surface of the hemispheres, lying in grooves formed by the convexities of their convolutions. The *superior* terminate in the superior longitudinal sinus. The *deep* commence within the lateral ventricles, and unite to form the *venæ galeni*, which, escaping through an opening, called the *fissure of Bichat*, terminates in the straight sinus.

The *cerebellar* are disposed like the cerebral, and terminate in the lateral and petrosal sinuses.

Sinuses of the Dura Mater.—These are irregular channels, formed by a splitting of the layers of the membrane, which are lined by a continuation of the inner coat of the veins. The principal are: 1. *Superior longitudinal;* attached to the falx cerebri; it extends along the middle line of the arch of the skull to the occipital bone, where it divides into the lateral sinuses. Its termination forms a dilatation, called *torcular Herophili*, which is the point of communication of the six sinuses, the superior longitudinal, two lateral, two occipital, and the straight. 2. *Inferior longitudinal;* situated in the lower free margin of the falx cerebri, terminating in the straight sinus. 3. *Straight;* extends across the tentorium, from the inferior longitudinal to the torcular Herophili. 4. *Occipital;* two canals commencing around the foramen magnum, and terminating in the torcular Herophili. 5. *Lateral;* these commence at the torcular Herophili, and terminate in the internal jugulars.

Fig. 79.



SINUSES OF THE BRAIN.

Fig. 79 represents a part of the sinuses of the dura mater. 1. Superior longitudinal sinus. 2, 2. Entrance of veins of the pia mater. 3. Falx cerebri. 4. Inferior longitudinal sinus. 5. Straight or fourth sinus. 6. Venæ Galeni. 7. Torcular Herophili. 8. Lateral sinuses. 9. Inferior petrosal sinus. 10, 11. Internal jugular veins.

SINUSES OF THE BASE OF THE SKULL.—These are five in number: 1. *Cavernous;* situated on each side of the sella turcica, receiving the ophthalmic veins, and terminating in the inferior petrosal. 2. *Inferior petrosal;* terminates in the internal jugular with the lateral. 3. *Circular;* surrounds the pituitary gland in the sella turcica, communicating on each side with the cavernous. 4. *Superior petrosal;* this establishes a communication between the cavernous and lateral on each side. 5. *Transverse;* passes across the basilir process of the occipital, forming a communication with the two inferior petrosal.

VEINS OF THE NECK.—The veins which return the blood from the head are: 1. *External jugular;* descends the neck from the parotid gland, in a line drawn from the angle of the lower jaw to the middle of the clavicle, crosses the sterno-mastoid muscle, and terminates in the subclavian. 2. *Anterior jugular;* this collects the blood from the superficial structures of the neck, and opens into the subclavian, near the preceding. 3. *Internal jugular;* commences at the foramen lacerum posterius on each side of the base of the skull, and descends near the carotids to the root of the neck, where it unites with the subclavian to form the vena innominata. It receives *facial, lingual, pharyngeal, occipital,* and *thyroid* branches. 4. *Vertebral;* descends by the side of the vertebral artery in the canal of the transverse cervical processes, and terminates at the commencement of the vena innominata.

VEINS OF THE UPPER EXTREMITIES.—These are divided into the *deep,* which accompany the arteries, and are called *venæ comites,* and the *superficial,* the principal branches of which are: 1. *Anterior ulnar*

running up the inside of the fore-arm to the elbow, where it becomes the basilic. 2. *Posterior ulnar*, ascends the back of the hand and fore-arm, and terminates in the anterior ulnar at the inner condyle. 3. *Basilic;* ascends from the common ulnar formed by the two preceding, along the inner side of the arm to the axilla, where it becomes the axillary vein. 4. *Radial;* commences in the large vein of the thumb, ascends the outer border of the fore-arm to the elbow, becoming there the cephalic. 5. *Cephalic;* ascends the outer side of the arm, and terminates in the subclavian beneath the clavicle. 6. *Median;* passes up between the anterior ulnar and radial; at the elbow it receives a branch from the deep veins, and divides into the median cephalic and median basilic. 7. *Median cephalic;* passes outward in the groove between the biceps and supinator longus to join the cephalic. 8. *Median basilic;* passes inward, and terminates in the basilic. The median cephalic and median basilic branches are commonly selected for the operation of *venesection*, or *bleeding*, by which that "minute instrument of mighty mischief"—the lancet of the surgeon—has shed more blood in the civilized world than has the sword of the warrior; in both cases unfortunately for science and humanity.

The Axillary Vein.—The venæ comites of the brachial artery and the basilic vein unite to form the axillary vein, which becomes the subclavian at the lower border of the first rib. It lies in front of the axillary artery.

The Subclavian Vein.—This crosses over the first rib beneath the clavicle, and unites with the internal jugular to form the vena innominata. It lies in front of the subclavian artery.

Veins of the Lower Extremities.—The *deep* veins accompany the arteries in pairs. Near the knee joint the *anterior* and *posterior tibial* and *peroneal* veins unite to form the popliteal, which, as it ascends, becomes the femoral, and then the external iliac.

The Popliteal Vein.—Ascending through the popliteal region it receives several *muscular* and *articular* branches, and the *external saphenous.*

The Femoral Vein.—This vein ascends the thigh in the sheath with the artery, and on entering the pelvis becomes the external iliac. It receives *muscular* veins—the *profunda*, and *internal saphenous.*

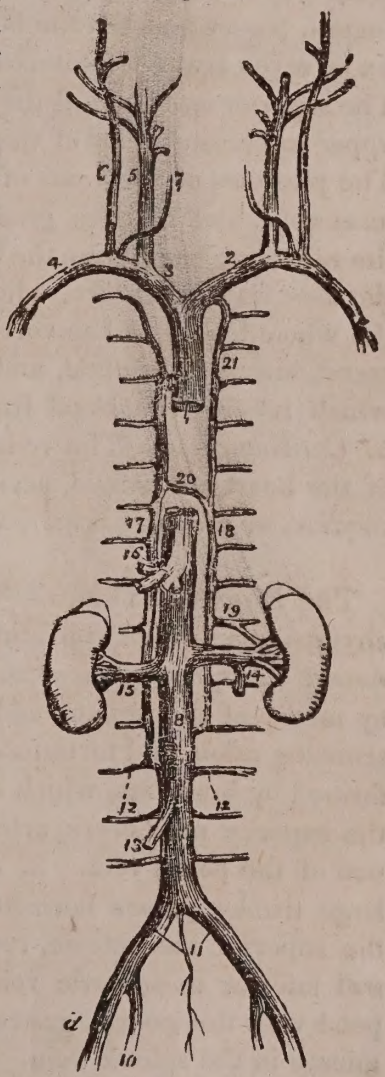
The *saphenous veins* collect the blood from the foot and leg.

Veins of the Trunk.—Of these there are seven divisions: 1. *Superior vena cava and its formative branches.* The *superior cava* is a short trunk, about three inches in length, formed by the junction of

the venæ innominatæ. It descends on the right side of the mediastinum, and entering the pericardium, terminates in the upper part of the right auricle. Its branches are: the *venæ innominatæ*, two large trunks formed by the union of the internal jugular and subclavian at each side of the root of the neck; the *right vena innominata* lies externally to the arteria innominata, and receives the right lymphatic duct, *right vertebral*, *right internal mammary*, and *right inferior thyroid veins*; the *left vena innominata*, much the longest, extends across the roots of the three great arteries arising from the arch of the aorta where it unites with the right to constitute the superior cava.

Fig. 80 is a representation of the principal veins of the trunk and neck. 1. Superior cava. 2. Left innominata. 3. Right innominata. 4. Right subclavian. 5. Internal jugular. 6. External jugular. 7. Anterior jugular. 8. Inferior cava. 9. External iliac. 10. Internal iliac. 11. Common iliac; the small vein between is the sacra media. 12, 12. Lumbar veins. 13. Right spermatic. 14. Left spermatic. 15. Right renal. 16. Trunk of the hepatic veins. 17. Greater azygos 18. Lesser azygos. 19. A branch communicating with the left renal. 20. Termination of the lesser in the greater azygos. 21. Superior intercostal, communicating below with the lesser azygos, and above in the left innominata.

Fig. 80.



VEINS OF THE TRUNK AND NECK

2. *Inferior vena cava, and its formative branches.* The inferior cava is formed by the union of the common iliac veins between the fourth and fifth lumbar vertebræ, ascends along the front of the spine, on the right of the aorta, passes through the fissure in the back side of the liver, and the opening in the middle of the diaphragm, to the right auricle. It receives as branches: 1. The *iliac veins*, *external* and *internal*, which commence in the pelvic cavity, and passing upward along its brim, terminate opposite the sacro-iliac symphisis, by uniting together to form the common iliac vein. 2. The *common iliac* receives the *epigastric* and *circumflexa ilii* immediately above Poupart's ligament; the *lumbar* veins from the loins; the *right spermatic* from the venous plexus in the spermatic cord—in the female the

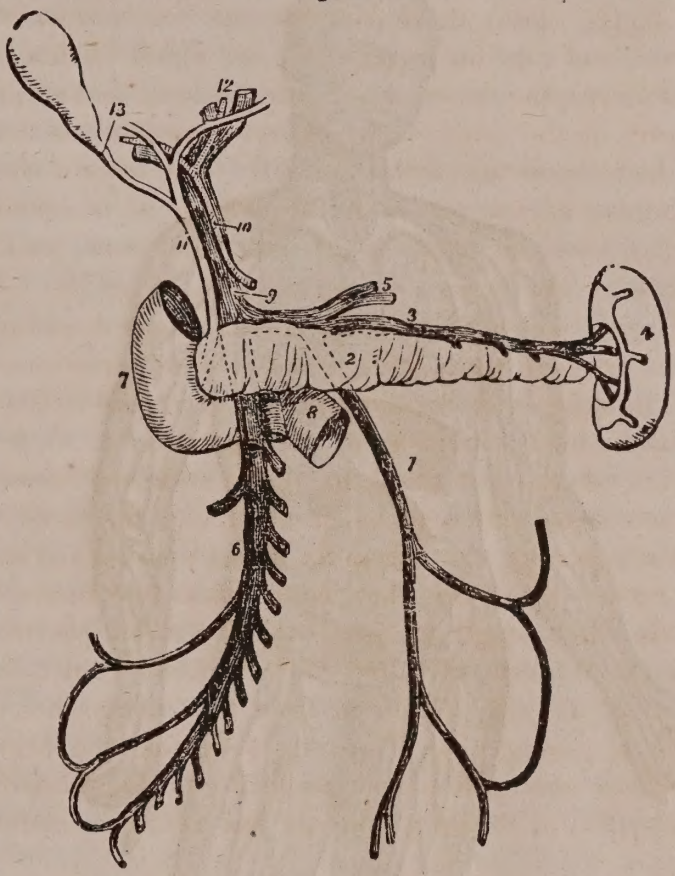
ovarian, from the ovaries, round ligaments, and Fallopian tubes; the *renal*, or *emulgent*, from the kidneys—the *left spermatic vein* is received by the left renal—and the *supra-renal*, *phrenic*, and *hepatic* from the ramifications of the renal and phrenic arteries and the liver. 3. *Azygos veins;* these comprise the *rena azygos major*, *vena azygos minor*, and *superior intercostal vein*, which form a communicating system between the superior and inferior cava, and return the blood from that part of the trunk in which these vessels are deficient on account of their connection with the heart. The *azygos major* commences in the lumbar region, passes up through the aortic opening in the diaphragm, and, receiving all the right intercostal veins, terminates in the superior cava. The *azygos minor* commences on the left side of the lumbar region, passes beneath the border of the diaphragm, and receiving the six or seven lower left intercostal veins, terminates in the azygos major. The *superior intercostal* is the trunk formed by the union of the five or six upper intercostal veins of the left side. 4. *Vertebral and spinal veins.* The plexuses of the veins of the vertebral column and spinal cord are numerous, and may be grouped into the *dorsi-spinal*, which receive the returning blood from the dorsal muscles and surrounding structures; the *meningeo-rachidian*, which form two longitudinal trunks extending the whole length of the vertebral column, pouring their blood into the sacral, lumbar, vertebral, and intercostal veins; and the *medulli-spinal*, which receive the blood from the membranes of the spinal marrow. 5. *Cardiac veins.* The veins returning the blood from the substance of the heart are named, according to their situation and size, the *great cardiac*, or *coronary*, *anterior* and *posterior cardiac*, and *venæ Thebesii*.

The Portal System.—The veins which return the blood from the chylopoietic viscera constitute the portal system. There are four of them: 1. *Inferior mesenteric;* this receives the blood from the rectum by means of the hemorrhoidal veins, from the sigmoid flexure and descending colon, and terminates in the splenic. 2. *Superior mesenteric;* formed by branches, which collect the blood from the ramifications of the superior mesenteric artery; it unites with the splenic in the formation of the portal vein. 3. *Splenic;* arises from the spleen in several large trunks, passes horizontally behind the pancreas, and unites with the superior mesenteric, receiving in its course the gastric, pancreatic, and inferior mesenteric veins. 4. *Gastric;* the gastric veins correspond with the gastric, gastro-epiploic, and vasa brevia arteries, and terminate in the splenic vein.

The Vena Portæ.—The portal vein is formed by the union of the

splenic and superior mesenteric veins behind the pancreas, ascends to the transverse fissure of the liver, where it divides into two branches, one of which is sent to each lateral lobe of that viscus; each primary branch then divides into numerous secondary branches. Within the liver the portal vein receives the venous blood from the capillaries of the hepatic artery.

Fig. 81.



THE PORTAL VEIN.

Fig. 81 shows the relations of the vena portæ. 1. Inferior mesenteric vein; the dotted lines trace its course behind the pancreas (2), to terminate in the splenic vein (3). 4. The spleen. 5. Gastric veins opening into the splenic. 6. Superior mesenteric. 7. Descending portion of the duodenum. 8 Its transverse portion. 9. Portal vein. 10. Hepatic artery. 11. The ductus communis choledochus. 12. The division of the duct and vessels at the transverse fissure of the liver. 13. The cystic duct leading to the gall bladder.

PULMONARY VEINS.—The veins which return the arterial blood from the lungs to the left auricle of the heart are four in number. They differ from veins in general, in being but little larger than their corresponding arteries, and in accompanying singly each branch of the pulmonary artery. The right pulmonary veins pass behind the superior cava, and the left behind the pulmonary artery, to the left auricle.

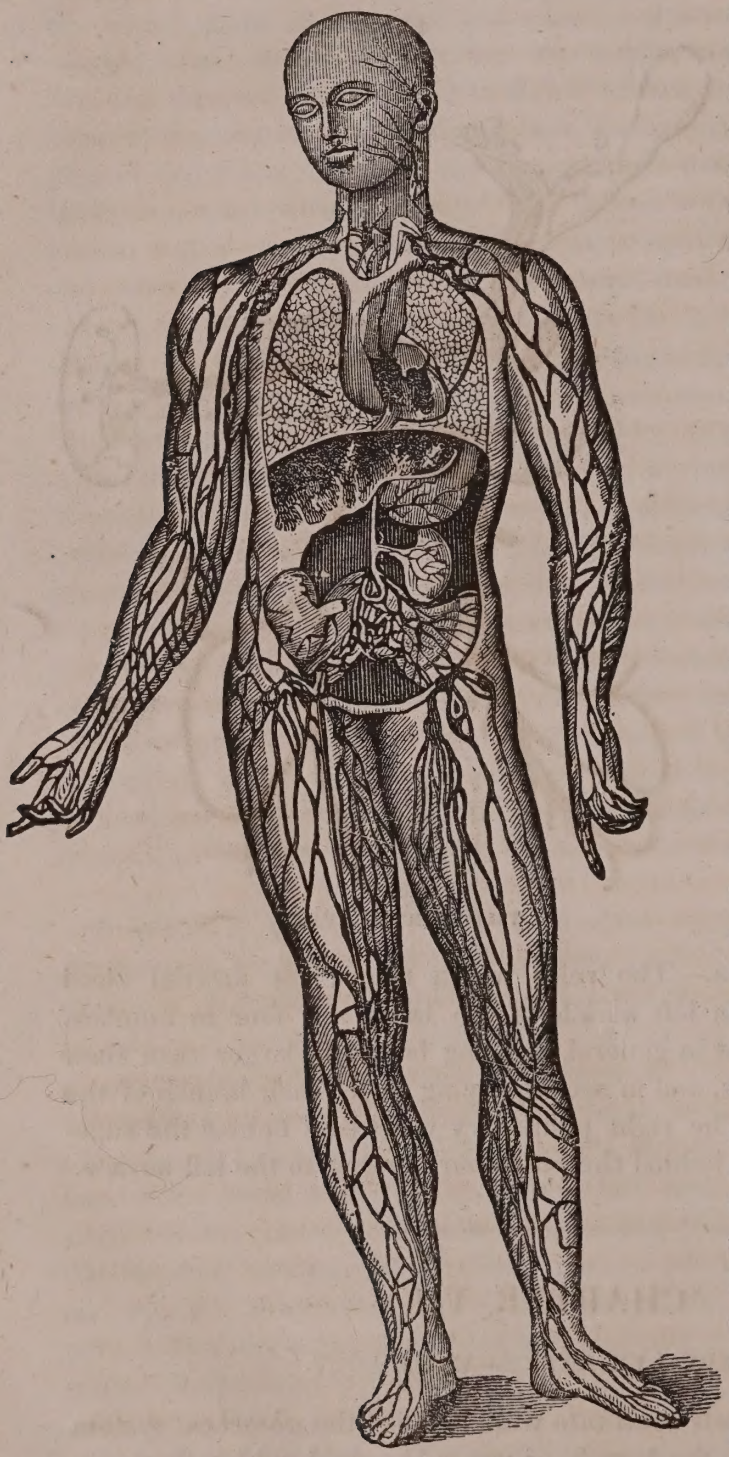
CHAPTER VII.

OF THE LYMPHATICS—ANGEIOLOGY.

THE lymphatic vessels constitute what is called the *absorbent* system. They are named from the lymph, or water-like fluid, which they con-

vey. They are minute transparent vessels, uniform in size, having numerous valves, which give them a knotted appearance, and before entering a gland divide into several branches. Their office is to collect the nutritive products of digestion from the alimentary canal, and the effete, disorganized matter from all parts of the body, and convey them into the venous blood near the heart.

Fig. 82.



LYMPHATIC SYSTEM.

Lymphatic vessels originate in a delicate network distributed throughout the skin, the various surfaces and internal structures of organs, and proceed in nearly straight lines toward the root of the neck. They are intercepted in their course by numerous oblong, flattened bodies, called *lymphatic glands*. The vessels entering these glands are called *vasa inferentia*, and those which leave them *vasa efferentia*. These divisions of the lymphatics subdivide just before entering and just after leaving the glands.

Though lymphatic vessels are generally distributed throughout the tissues—probably all the tissues—yet they have never been detected in the brain, spinal cord, eye, bones, cartilages, tendons, membranes of the ovum, umbilical cord, and placenta.

Like arteries and veins, they are composed of three coats. Anastomoses between them occur, though less frequently than with arteries and veins. They are smallest in the neck, larger in the upper, and still larger in the lower extremities.

The *valves* of lymphatic vessels give them a knotty or constricted appearance similar to that of the veins; near the glands the valves are most numerous. The presence of valves is marked by two small dilatations, or pouches, analogous to the valvular sinuses of the veins. These sinuses are always on the side of the valves toward the heart.

Lymphatic glands are composed of a minute plexus of lymphatic vessels, intimately connected with a plexus of blood-vessels, and enclosed in a thin capsule of cellular tissue. In their internal substance numerous convolutions are formed by the lymphatic vessels. In form they are small, oval, somewhat flattened or rounded bodies, termed conglobate, or absorbent, presenting a lobulated appearance on the surface, while the face of a section appears cellular, from the division of the numberless convolutions which are formed by the lymphatic vessels within its substance. These glands are larger in young persons than in the adult, and smallest in old age.

The *lacteals* are the lymphatic vessels of the small intestines, which convey the milk-like fluid, called *chyle*, to the thoracic duct. These are the *nutritive* absorbents, and in their course pass through the numerous glands of the mesentery.

The *superficial lymphatic vessels* follow the course of the veins, passing through the deep fascia in convenient situations to join the deep lymphatics.

The *superficial lymphatic glands* are placed in the most protected situations of the superficial fascia, as in the hollow of the ham and groin, and on the inner side of the arm.

The *deep lymphatics* accompany the deep veins; those from the lower part of the body converging to the glands around the inferior vena cava, and terminating in the thoracic duct. From the upper part of the trunk of the body on the left side, and from the left side of the head and neck, they also proceed to the thoracic duct. But those on the right side of the head and neck, right arm, and right side of the thorax, form a distinct duct, which terminates at the junction of the right subclavian and internal jugular veins

Fig. 83.

LYMPHATIC CENTRE.

Fig. 83 exhibits the course and termination of the thoracic duct. 1. Arch of the aorta. 2. Thoracic aorta. 3. Abdominal aorta and its branches. 4. Arteria innominata, dividing into right carotid and right subclavian. 5. Left carotid. 6. Left subclavian. 7. Superior cava, formed by the union of 8, the venæ innominatæ, and then by the junction (9) of the internal jugular and subclavian at each side. 10. Greater azygos vein. 11. Termination of the lesser azygos in the greater. 12. Receptaculum chyli; several lymphatic trunks are seen opening into it. 13. Thoracic duct, divided opposite the middle of the dorsal vertebræ into two branches, which soon reunite; the course of the duct behind the arch of the aorta and left subclavian artery is shown by a dotted line. 14. The duct, making its turn at the root of the neck, and receiving several lymphatic trunks before terminating in the venous circulation. 15. Termination of the trunk of the right lymphatic duct.

THE THORACIC DUCT.—This is the centre of the lymphatic system. It commences in the abdomen by a triangular dilatation, called *receptaculum chyli*, which is situated on the front of the body of the second lumbar vertebra. From this it ascends through the aortic opening of the diaphragm to the fourth dorsal vertebra, where it inclines to the left, passes behind the arch of the aorta, ascends by the side of the æsophagus to the root of the neck, and curving forward and downward pours its contents into the venous blood at the junction of the left subclavian with the left internal jugular vein. In size it is about equal to the diameter of a goose-quill. Its termination is provided with valves to prevent the admission of venous blood. It receives as branches four or five large trunks, which unite to form the chylous receptacle, the trunks of the lacteals, a large trunk from the liver; also branches from the thoracic viscera and parieties, and trunks from the left side of the head, neck, and upper extremity.

THE DUCTUS LYMPHATICUS DEXTER.—This is a short trunk which receives the lymphatic vessels from the right side of the head, neck, right arm, right lung, right side of the chest, and some branches from the liver. Like the thoracic duct, it is provided with valves,

where it discharges its contents into the veins, at the point before mentioned.

Lymphatics of the Head and Neck.—The principal *superficial glands* are the *occipital*, *posterior auricular*, *parotid*, *zygomatic*, *buccal*, and *submaxillary*, situated as their names indicate, and the *cervical*, extending along the course of the external jugular vein. The *deep glands* are numerous and large around the internal jugular veins and carotid arteries, extending from the base of the skull to the root of the neck.

The *superficial vessels* are disposed in *occipital*, *temporal* and *facial* groups, which converge to the deep cervical, parotid, and submaxillary glands. The *deep vessels* are the *meningeal* and *cerebral*, which pass through foramina at the base of the skull to terminate in the deep cervical glands.

Lymphatics of the Upper Extremity.—The *superficial glands* are few and small in the arm and fore-arm. The principal chain of deep glands accompanies the brachial artery. The *axillary glands* are large and numerous; a small chain of them extends along the lower border of the large pectoral muscle to the mammary gland. They receive the lymphatics of the integuments of the chest and the mammary gland.

The *superficial vessels* commence upon the fingers, and course along the fore-arm to the elbow, where they are arranged in two groups, which extend upward to the axillary glands of the armpit.

The *deep vessels* accompany the blood-vessels, communicate occasionally with the superficial, and enter the axillary and subclavian glands.

Lymphatics of the Lower Extremity.—The *superficial inguinal glands* are those of the groin; the smallest group extends along the course of Poupart's ligament, and receives vessels of the walls of the abdomen, gluteal region, perineum, and genital organs; the largest group clusters around the termination of the internal saphenous vein, and receives the vessels of the lower extremities. The *deep glands* are the *anterior tibial*, *popliteal*, *deep inguinal*, *gluteal*, and *ischiatic*, situated in the regions after which they are named.

The *superficial vessels* are divisible into an *internal* group, commencing on the dorsum of the foot, and ascending the leg along the internal saphenous vein to the glands of the groin, and an *external* group, which commences on the outer side of the foot and back part of the ankle, and accompanies the external saphenous vein to the popliteal glands.

The *deep vessels* follow the deep veins and arteries, and, after joining the deep inguinal glands, communicate with the numerous glands around the iliac vessels.

Most of the efferent lymphatics from the superficial inguinal glands communicate with the large gland in the femoral ring, by which a communication is established between the lymphatics of the trunk and those of the lower extremity.

Lymphatics of the Trunk.—These may be arranged into three groups: 1. *Superficial;* the *superficial vessels* of the upper part of the trunk converge to the axillary glands, and to those at the root of the neck. Those of the lower half of the trunk, gluteal region, perineum, and external organs of generation, converge to the upper group of superficial inguinal glands. 2. *Deep;* the *deep glands* are the *intercostal*, situated on each side of the vertebral column, the *internal mammary*, in the intercostal spaces beside the internal mammary arteries, and the *anterior* and *posterior mediastinal*, situated about the large vessels at the root of the heart, and extending along the course of the aorta and œsophagus in the mediastinum, communicating with the deep cervical, intercostal, and abdominal glands; the *lumbar*, numerously situated around the common iliac vessels, aorta, and vena cava; the *external iliac*, placed around the external iliac vessels; the *internal iliac*, located along the course of the internal iliac vessels, and the *sacral*, placed on the concave surface of the sacrum. The *deep vessels of the thorax* are the *intercostal*, following the course of the intercostal arteries; the *internal mammary*, which commence in the walls of the abdomen, and, communicating with the epigastric, ascend to the root of the neck; the *diaphragmatic*, which pursue the direction of their corresponding veins. The *deep vessels of the abdomen* are continued upward from the thigh, beneath Poupart's ligament, and along the external iliac vessels to the lumbar glands, receiving in their course the epigastric, circumflexa ilii, and ilio-lumbar vessels. Those from the walls of the pelvis and from the gluteal, ischiatic, and obturator vessels, follow the course of the internal iliac arteries, and unite with the lumbar lymphatics; and the lumbar vessels, after receiving all the lymphatics from the lower extremities, pelvis, and loins, terminate by several large trunks of the receptaculum chyli. 3. *Visceral;* the *lymphatic vessels of the lungs* are of large size, distributed throughout their textures and surfaces, and converge to the numerous glands around the roots of the lungs and bifurcation of the trachea. These *bronchial glands* in the adult are of a variable brownish tint, and in old age present a deep black color

Those of the *heart* follow the course of its blood-vessels to the glands around the arch of the aorta, and to the bronchial glands. The *lymphatic vessels of the liver* proceed from its different parts to the glands, along the course of the hepatic artery and lesser curve of the stomach, mediastinal glands, to those situated around the inferior cava, and to the lumbar glands; those from the gall-bladder, which are large, and form a remarkable plexus, enter the glands in the right border of the lesser omentum.

Those of the *spleen* and *pancreas* pass through the splenic glands, and those along the course of the splenic vein, and join the aortic glands before entering the thoracic duct.

Those of the *stomach* proceed variously to the glands along its lesser and greater curves, and to the splenic, pyloric, and aortic glands.

The lymphatics of the *small intestines* are of two kinds: those which run upon the surface and belong to their structure, and those which commence in the substance of the mucous membrane, and are called lacteals. Both enter the *mesenteric glands*. These glands are situated between the layers of the mesentery, in the meshes formed by the superior mesenteric artery. They are most numerous and largest near the duodenum, and near the termination of the ileum.

The *lacteals* commence by tubular mouths, which open into a fine network, situated in the sub-mucous tissue, from whence they proceed to the mesenteric glands, and thence to the thoracic duct.

Those of the *large intestines* proceed in two different directions: the vessels of the cæcum, ascending and transverse colon, traverse their own proper glands, and then enter the mesenteric, and those of the descending colon and rectum proceed to the lumbar glands.

Those of the *kidneys* follow the blood-vessels to the lumbar glands, situated around the aorta and inferior cava; those of the supra-renal capsules, which are very large and numerous, terminate in the renal.

Those of the *pelvic viscera* terminate in the sacral and lumbar glands.

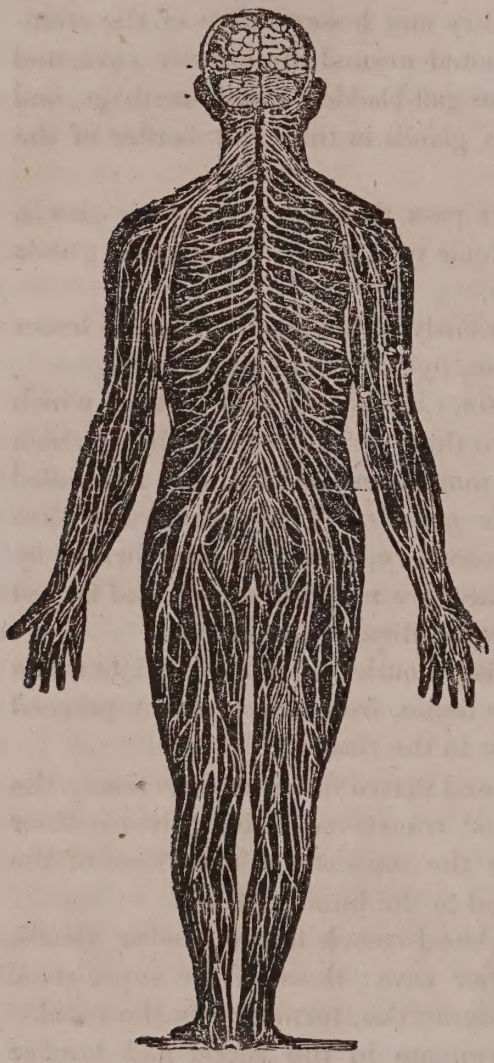
CHAPTER VIII.

OF THE NERVES—NEUROLOGY.

The nervous system may be divided into two sub-systems—the *cerebro-spinal* and the *organic*. The former comprises the brain, spinal marrow, the nerves of sensation, and the nerves of motion; the

latter embraces the nerves and ganglions which preside over the development and functional changes of the body; this division of the nervous structure has been called the *sympathetic*, *ganglionic*, and more properly, the *organic system*. This system is essential to animal existence; the lowest animals are destitute of the cerebro-spinal structure.

Fig. 84.



NERVOUS SYSTEM.

The nervous tissue is enclosed in membranes, or sheaths, and consists of two pulpy materials, one of which is of a white color —the *medullary* substance, and the other gray-colored—the *cineritious* substance. The *medullary structure* is fibrous, the fibres being looped at their terminations, and containing a central stripe, called the *cylinder axis of Purkinje*. The *cineritious* is more vascular, and composed of kidney-shaped globules, containing a vesicular nucleus with a nucleolus. These globules are soft, and of a yellow or brownish color.

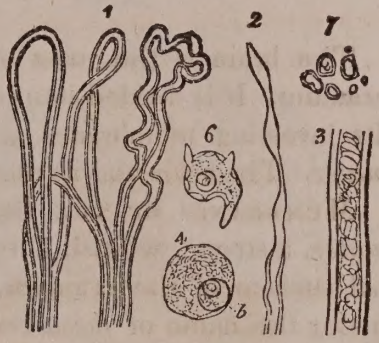
The *ganglions* and *nervous centres* consist of a mixture of white fibres and gray globules. The sheath of the nerves is called *neurilemma*, and the enclosed matter *neurine*. The trunks of nerves frequently interchange trunks or fasciculi, forming *anastomoses*; and a combination of these anastomoses into a network forms a *plexus*.

Numerous small elliptical bodies, attached to the ulnar and digital nerves, are called *Pacinian corpuscles*; these have no terminal loops, being the only exception to the general rule.

Microscopic observation makes out the elements of the nervous system to be, white nerve-fibres, gray nerve-fibres, *nerve-cells*, and *nerve-granules*.

Fig. 85 represents the microscopic elements of the nervous structure. 1. Mode of termination of white nerve-fibres in loops; three of these loops are simple, the fourth is convoluted. The latter is found in situations where a high degree of sensation exists. 2. A white nerve-fibre from the brain, showing the varicose or knotty appearance produced by traction or pressure. 3. A white nerve-fibre enlarged to show its structure, a tubular envelope and a contained substance—neurilemma and neurine. 4. A nerve-cell, showing its composition of a granular-looking capsule and granular contents. 5. Its nucleus containing a nucleolus. 6. A nerve-cell, from which several processes are given off; it contains also a nucleated nucleus. 7. Nerve-granules.

Fig. 85.



MINUTE NERVOUS STRUCTURE.

White nerve-fibres compose most of the brain, spinal cord, and cerebro-spinal nerves, and enter into the structure of the organic system. They terminate in the various internal organs, at the surface of the body, and in the substance of the cerebro-spinal axis, by forming loops. In size they vary from $\frac{1}{2000}$ to $\frac{1}{14000}$ of an inch in diameter.

Gray nerve-fibres are smaller in diameter, and less transparent. They constitute the principal part of the organic system, and are also present in the cerebro-spinal nerves, most abundantly in those of sensation.

The *nerve-cells* vary from $\frac{1}{300}$ to $\frac{1}{1250}$ of an inch in diameter. They are composed of a capsular sheath, containing a reddish-gray granular substance, and one or more nuclei and nucleoli, the nucleus being attached to the sheath. Nerve-cells are found in the gray substance of the brain and spinal cord, in the ganglions of the cerebro-spinal nerves, and in the organic nerves and their ganglia. From the circumference of the nerve-cells arise one or more delicate thread-like processes, from $\frac{1}{1000}$ to $\frac{1}{10000}$ of an inch in diameter, which are the origins of the gray nerve-fibres.

The *nerve-granules* exist in the forms of minute homogeneous particles, aggregated particles, and nucleated corpuscles, varying in diameter between $\frac{1}{5000}$ and $\frac{1}{15000}$ of an inch. They serve as a bond of connection between the fibres and cells of the brain and spinal cord, and enter into the various ganglia.

A *nerve* is a collection of nerve-fibres into small bundles, or fasciculi, each fasciculus being invested by a distinct neurilemma. Several of these fasciculi are again collected into larger bundles, which are also enclosed in a separate neurilemma; then again the larger fasciculi are collected into a grand bundle, which is enclosed in a general neurilemma, or sheath of white fibrous tissue

THE BRAIN.

The brain is the mass of nervous substance contained within the cranium. It is divided into *cerebrum*, *cerebellum*, and *medulla oblongata*. Its investing membranes are called *dura mater*, *arachnoid*, and *pia mater*. The brain and its membranes together constitute the *encephalon*.

MEMBRANES OF THE BRAIN.—The external covering is the *dura mater*, a strong, whitish fibrous membrane which adheres to the internal surface of the cranium, and is prolonged into the spinal column under the name of *theca vertebralis;* but there it is not adherent to the bones. From its internal surface processes extend inward to support and protect different parts of the brain, and externally other processes for sheaths for the nerves passing out of the skull and spinal column. Its internal processes are the *falx cerebri*, which extends vertically across the median line from the crista galli of the ethmoid bone to the tentorium, dividing the cerebrum into *right* and *left hemispheres;* the *tentorium*, which stretches horizontally across the cranium, separating the cerebrum from the cerebellum; and the *falx cerebelli*, which divides the cerebellum into two lobes or hemispheres.

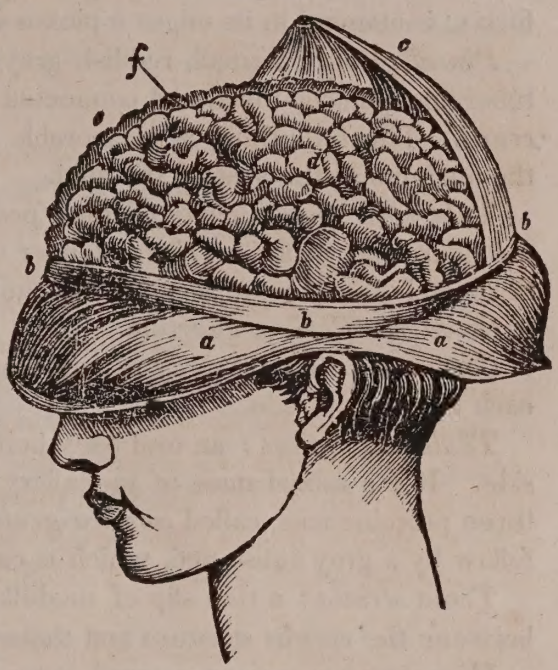
The *arachnoid membrane* is the middle covering and the serous membrane of the cerebro-spinal centre. It is very thin and transparent. It surrounds the nerves until their exit from the brain, where it is reflected back upon the dura mater. It does not enter into the ventricles.

The *pia mater* s the internal covering, vascular, consisting of innumerable blood-vessels held together by a thin layer of cellular tissue. It invests the whole brain and each of its convolutions by extending through all the fissures between them. It contains usually a number of small granular bodies, called the *glandulæ Pacchioni;* these are larger in old persons, and are considered by some anatomists to be of morbid origin. The pia mater is the nutrient membrane of the brain.

THE CEREBRUM.—The cerebral portion of the brain is an oval mass divided superiorly into two hemispheres by the great longitudinal fissure. Each hemisphere is divided on its *under surface* into *anterior*, *middle*, and *posterior lobes*. The *anterior* rests upon the roof of the orbit, the middle is received into the middle fossa at the base of the skull, and the posterior is supported by the tentorium. The surface of the cerebrum presents a number of slightly convex elevations, constituting the convolutions, called *gyri*, which are separated from each other by sulci or fissures of various depths. The interior cerebral substance is medullary, and the exterior cinerticious to the depth of one or two lines

The external surface of the cerebrum is seen in Fig. 86. *a a.* The scalp turned down. *b b.* Cut edges of the skull bones. 3. The dura mater suspended by a hook. 4. The left hemisphere.

Fig. 86.



THE BRAIN EXPOSED.

The anatomical distinctions of the cerebrum are the following:

Crura cerebri; two thick white cords diverging from the anterior border of the pons varolii, their fibres terminating in the hemispheres. A layer of medullary matter occupies a triangular space between them, which is called the *locus perforatus.*

Eminentiæ mammillares; two white globular bodies, near the size of a pea, between the crura and in front of the locus perforatus.

Tuber cinereum; a soft gray mass in front of the eminentiæ mammillares, and behind the chiasm of the optic nerves.

Infundibulum; a hollow, conical, reddish body resting on the tuber cinereum, and attached by its apex to the pituitary gland.

Pituitary gland; a vascular mass, consisting of two lobes, which occupies the sella turcica.

Longitudinal fissure; the sulci which separates the hemispheres laterally, and contains the falx cerebri.

Corpus callosum; a white arched band, forming the *great commissure* between the two hemispheres at the bottom of the longitudinal fissure. It is about an inch broad and three and a half inches long. Its fibres are mostly medullary matter; a few, however, are cineritious; these pass longitudinally, and are called the *raphé.*

Septum lucidum; a vertical partition separating the lateral ventricles. It is in contact superiorly with the corpus callosum, and below with the fornix.

Fornix; a triangular arch, the base of which is continuous with the corpus callosum behind; its apex divides into two *crura*, which terminate in the eminentia mammillares; its under surface is called *lyra* Under these crura is the *foramen of Munro*, which communicates between the third and the two lateral ventricles.

Velum interpositum; a triangular process of pia mater under the fornix, containing in its edges a plexus of veins, called *plexus choroides.*

Pineal gland; a small, reddish-gray, conical body, situated upon the tubercula quadrigemina, and connected with the optic tubercles by two *crura.* This little thing is memorable from having been regarded by the ancients as the seat of the soul.

Tubercula quadrigemina; four prominences over the junction of the pons and crura cerebri. Under them is a passage between the third and fourth ventricles, called the *aqueduct of Sylvius*, or *iter a tertio ad ventriculum quartum.*

Corpus striatum; a gray oblong mass medullary within, situated in each lateral ventricle.

Thalamus opticus; an oval body behind the corpus striatum on each side. It is a mixed mass of medullary and cineritious matter, and has three prominences, called *corpora geniculata.* It is connected with its fellow by a gray substance, which is called the *soft commissure.*

Tenia striata; a thin slip of medullary matter occupying the groove between the corpus striatum and thalamus opticus.

Hippocampus major; a scroll extending into the inferior cornu of the lateral ventricle; its extremity resembles a foot, and is called the *pes hippocampi.*

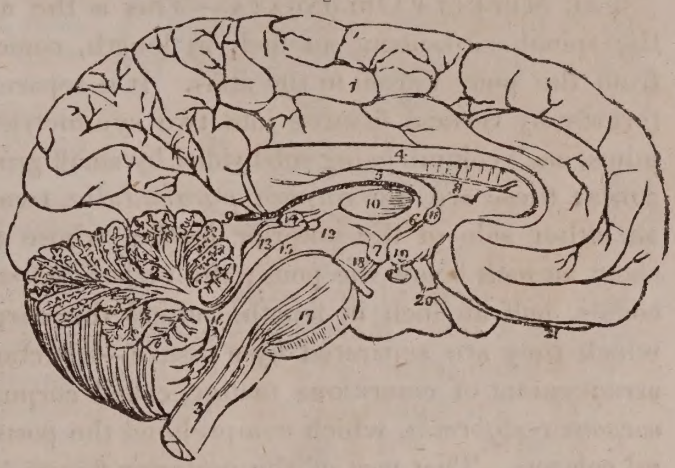
Corpus fimbriatum; a thin edge of medullary matter on the concave side of the hippocampus major; beneath it is a layer of cineritious substance, having a serrated appearance, called the *fascia dentata.*

Hippocampus minor; a conical elevation, resembling the spur of a cock, pointing backward into the posterior cornu.

Ventricles; five in number. The *lateral* exist in each hemisphere, and contain the corpus striatum and thalamus opticus; the roof is formed by the corpus callosum. In each are three angular depressions, called *cornua;* the posterior contains the hippocampus minor, the inferior the hippocampus major, the anterior is vacant. They are partially separated by the septum lucidum, but communicate with each other and with the third by the foramen of Munro. The *third ventricle* is the space between the thalami optici. Its roof is formed of the velum interpositum and fornix, and its floor by the locus perforatus and the tuber cinereum. Its front is traversed by the anterior commissure, a medullary cord extending between the corpora striata, and by the posterior commissure, which extends transversely between the thalami optici. It communicates with the fourth by the aqueduct of Sylvius, and with the lateral by the foramen of Munro. The *fourth ventricle* is situated between the pons Varolii, cerebellum, and medulla oblongata. Its floor is the calamus scriptorius, and its roof is the *valve of the brain*

It communicates only with the third. Laterally it is limited by the pia mater and arachnoid. The *fifth ventricle* is situated between the laminæ of the septum lucidum, and has no communication with the others.

Fig. 87.



MESIAL SURFACE OF THE BRAIN.

Fig. 87 represents the mesial surface of a longitudinal section of the brain. 1. Inner surface of left hemisphere. 2. Divided centre of the cerebellum, showing the arbor vitæ. 3. Medulla oblongata. 4. Corpus callosum. 5. Fornix. 6. One of the crura of the fornix. 7. One of the corpora albicantia, pea-shaped bodies between the crura cerebri. 8. Septum lucidum. 9. Velum interpositum. 10. Section of the middle commissure in the third ventricle. 11. Section of the anterior commissure. 12. Section of the posterior commissure. 13. Corpora quadrigemina. 14. Pineal gland. 15. Aqueduct of Sylvius. 16. Fourth ventricle. 17. Pons Varolii, through which are seen passing the diverging fibres of the corpora pyramidalia. 18. Crus cerebri of the left side; the third nerve arising from it. 19. Tuber cinereum, from which projects the infundibulum, having the pituitary gland appended to its extremity. 20. One of the optic nerves. 21. The left olfactory nerve terminating anteriorly in a rounded bulb.

THE CEREBELLUM.—The cerebellar portion constitutes one sixth or one seventh of the brain. It is an oblong, flattened body, situated between the occiput and tentorium. Its external substance is cineritious, and the internal medullary. It is divided by a longitudinal fissure into two hemispheres; in the upper part of this fissure is a ridge, called *vermis superior*; in front of this is an elevation, called *monticulus*; in the lower part of the fissure is a smaller ridge, called *vermis inferior*. Two small protuberances are seen at the root of the crura cerebelli, the lower of which is called *lobulus amygdaloides*, and the upper *lobulus nervi pneumogastrici*. Extending from the lower surface of the cerebellum to the *corpora restiformia* is a thin gray plate, called *the valve of the brain*. The substance of the cerebellum, on a section being made in either lobe, presents an arborescent arrangement of medullary matter, called *arbor vitæ*. A gray mass in the trunk of this medullary tree, with serrated edges, is called *corpus dentatum*. The cerebellum is associated with the rest of the encephalon by means of three pairs of rounded cords, called *superior*, *middle*, and *inferior peduncles*. Its two hemispheres are united by the commissure called

pons Varolii; this consists of transverse fibres, separated into two layers by the fasciculi of the corpora pyramidalia and corpora olivaria. These two layers, the upper and lower on each side, are collected together to form the *crura cerebelli.*

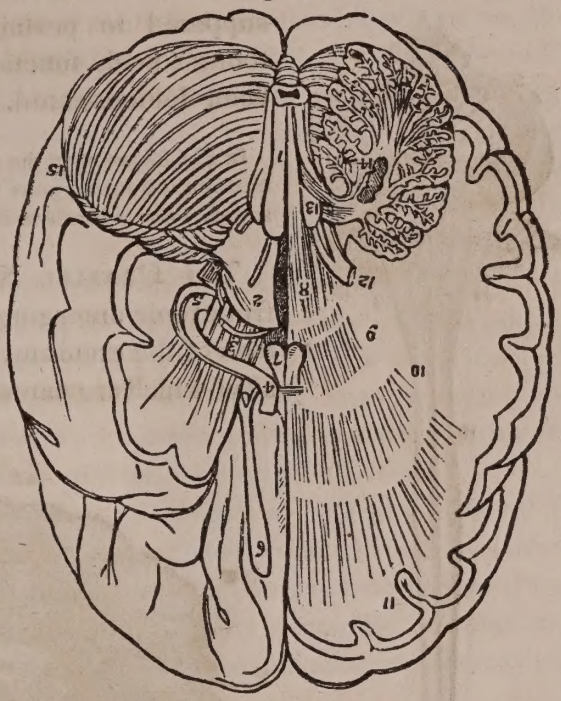
The Medulla Oblongata.—This is the upper enlarged part of the spinal cord, about an inch in length, conical in shape, extending from the pons Varolii to the atlas. It is separated anteriorly and posteriorly by vertical fissures into two symmetrical lateral cords, or columns, each column being subdivided by small grooves into three smaller cords; these are the *corpora pyramidalia*, two narrow tapering cords on either side of the anterior fissure, whose fibres decussate freely about an inch below the pons; the *corpora olivaria*, two oblong convex bodies, half an inch in length, behind the corpora pyramidalia, from which they are separated by a fissure—a section of them exhibits an arrangement of cineritious matter, called corpus fimbriatum; and the *corpora restiformia*, which comprehend the posterior half of each lateral column. That part of the posterior fissure between them is called *calamus scriptorius*, across which pass transverse fibres of medullary matter. Two slightly convex columns of the medulla oblongata, which enter into the formation of the floor of the fourth ventricle, are called *funiculi teretes*, or *posterior pyramids.*

The fibres composing the columns of the medulla oblongata have a peculiar arrangement on its upper part; those of the corpora pyramidalia and olivaria enter the pons Varolii, and are prolonged through the crura cerebri, thalami optici, and corpora striata to the hemispheres of the cerebrum; while those of the corpora restiformia are reflected backward into the cerebellum, and form its inferior peduncles. These fibres were termed by Gall the *diverging fibres.* They constitute both the cerebrum and cerebellum; while another set of fibres, called *converging*, associate their symmetrical halves and distant parts of the same hemispheres. These converging fibres constitute the *commissures* of the brain already mentioned. The corpus callosum is the commissure of the hemispheres; the fornix, septum lucidum, the bodies called anterior, middle, and posterior commissures, and the peduncles of the pineal gland, connect different parts of the cerebrum, while the pons Varolii connects the hemispheres of the cerebellum.

The gray matter which is intermixed with the white fibres of the medulla oblongata was regarded by Gall and Spurzheim as the channels of nutrition this supposition is strengthened by the great vascularity of the former substance, which enables it to convey a large proportion of the elements of growth and development

In Fig. 88 are seen several sections of the base of the brain, the distribution of the diverging fibres. 1. Medulla oblongata. 2. Half of the pons Varolii. 3. Crus cerebri, crossed by the optic nerve (4), and spreading out into the hemisphere, where it is called *corona radiata*. 5. Optic nerve. 6. Olfactory nerve. 7. Corpora albicantia. 8. Fibres of the corpus pyramidale passing through the pons. 9. The fibres passing through the thalamus opticus. 10. The fibres passing through the corpus striatum. 11. Their distribution to the hemisphere. 12. Fifth nerve. 13. Fibres of the corpus pyramidale, which pass outward with the corpus restiforme into the cerebellum. 14. Section through one of the hemispheres of the cerebellum, showing a body called corpus rhomboideum in the centre of its white substance, and the arbor vitæ. 15. The opposite hemisphere.

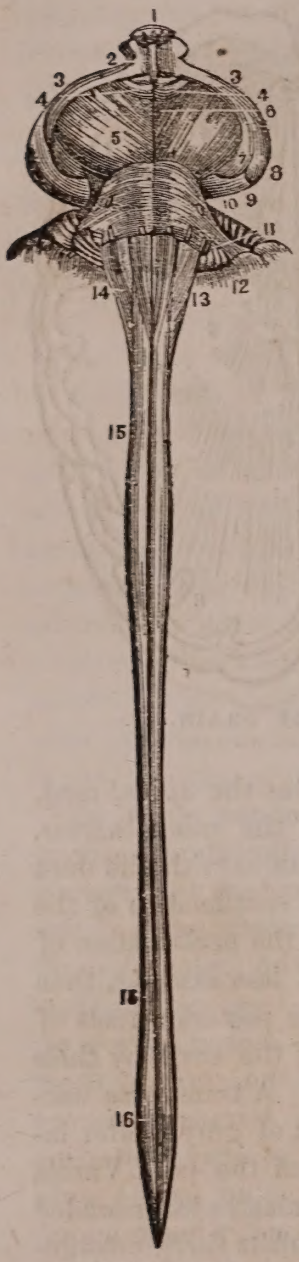
Fig. 88.



BASE OF THE BRAIN.

THE SPINAL CORD.—The spinal column contains the *spinal cord*, *medulla spinalis*, its *membranes*, and the *roots* of the *spinal nerves*. Its outer membrane is the *theca vertebralis*, continuous with the dura mater of the skull; the central is the *arachnoid*, a continuation of the serous membrane of the brain, and the internal is the prolongation of the *pia mater*, which is more firm and fibrous, and less vascular, than in the brain. The anterior are separated from the posterior roots of the spinal nerves throughout the entire length of the cord, by their processes of pia mater, called *membrana dentata*. A transverse section of the spinal marrow exhibits an arrangement of gray matter internally and medullary externally. It extends from the pons Varolii to the first or second lumbar vertebra, where it terminates in a rounded point. Its diameter varies in different parts, and exhibits three enlargements, the uppermost being the *medulla oblongata*, the middle corresponding with the origin of the nerves of the upper extremities, and the lower corresponding with the origin of nerves that supply the lower extremities. It is divided into lateral halves by *anterior* and *posterior longitudinal fissures*, which extend deeply into its substance. Each lateral half is divided by a lateral sulcus, or fissure, into anterior and posterior columns, the anterior giving origin to the nerves of *motion*, and the posterior to those of *sensation*. Another slight fissure indicates

Fig. 89.



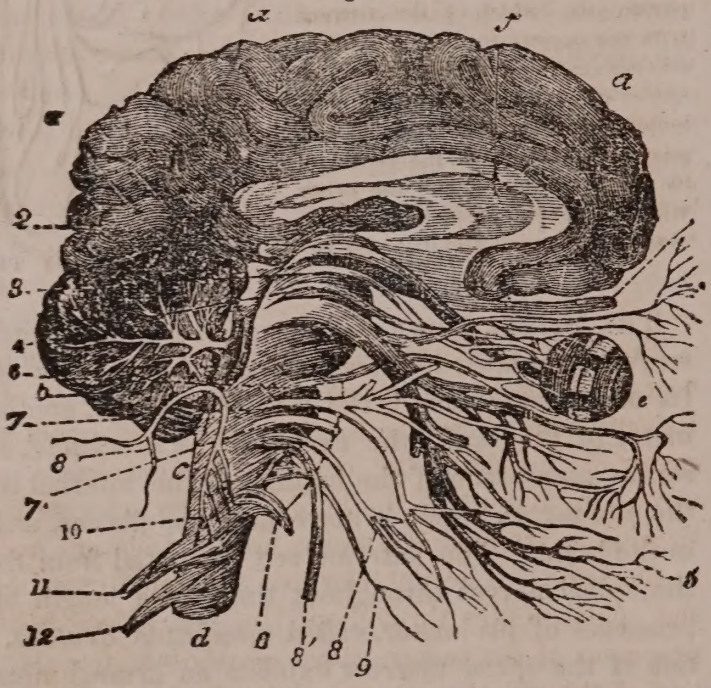
SPINAL CORD.

a middle lateral column, which Sir Charles Bell supposed to pertain to the respiratory nerves, though such functional arrangement has not yet been demonstrated.

In Fig. 89 are seen the relations of the spinal marrow to the medulla oblongata, pons Varolii, and cerebellum, as well as the several enlargements in its course.

THE CRANIAL NERVES.—These are so called from their emerging through the foramina at the base of the cranium. There are *nine pairs* of them, all of which are named numerically and functionally.

Fig. 90.



THE NERVES CONNECTED WITH THE BRAIN.

Fig. 90 shows the origin of the cranial nerves. The numbers are placed against the corresponding pairs of nerves. 11 and 12 are spinal nerves. *a a a.* Cerebrum. *b.* Cerebellum. *c.* Medulla oblongata. *d.* Medulla spinalis. *f.* Corpus callosum.

First Pair—Olfactory; the nerves of smelling. Each arises by three roots, which unite in the fissure of Sylvius; passing forward it enlarges into a bulbous mass of white and gray substance, which rests on the cribriform plate of the ethmoid bone. From this *bulbous olfactorius* the nerves are given off which are distributed upon the mucous membrane of the nose.

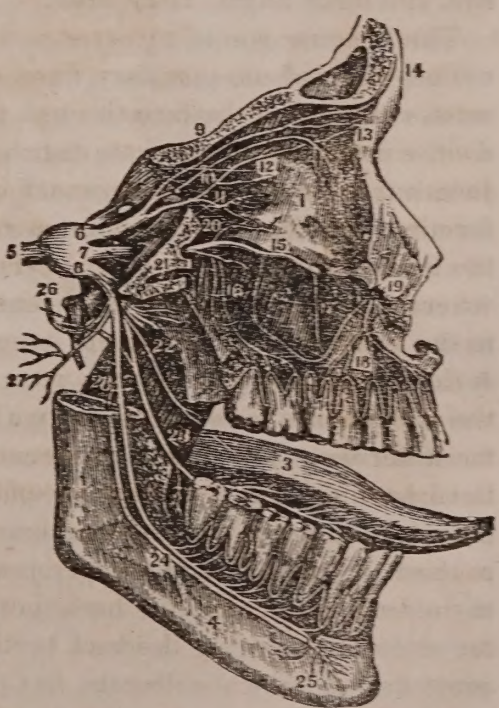
Second Pair—Optic; the nerves of seeing. Each is a large cord arising from the thalamus opticus and tubercula quadrigemina, winding around the crus cerebri as a flattened band, under the name of *tractus opticus*, joining its fellow in front of the *tuber cinereum*, forming a chiasm called the *optic commissure*, then proceeding forward it diverges from its fellow, and passes through the optic foramen to the eyeball, pierces the sclerotic and choroid coats, and expands into the nervous membrane called the *retina*.

Third Pair—Motores oculorum; nerves of motion. They arise from the crus cerebri, pass forward between the posterior cerebral and superior cerebellar artery, and through the sphenoidal foramen to be distributed to all the muscles of the eyeball except the external rectus and superior oblique. Each sends a branch to the ophthalmic ganglion, from which proceed the ciliary nerves that supply the iris.

Fourth Pair—Pathetici; nerves of motion, and the smallest of the cerebral. Each patheticus arises from the valve of the brain (valve of Viessens), winds around the crus cerebri, passes along the cavernous sinus, and entering the orbit at the sphenoidal fissure, is distributed to the superior oblique muscle. In the sinus it gives off a *recurrent branch* to the lining membrane.

In Fig. 91 is seen the distribution of the fifth pair of nerves. 1. Orbit. 2. Antrum of the upper jaw. 3. Tongue. 4. Lower jaw. 5. Root of the fifth pair, forming the ganglion of Casser. 6. Ophthalmic branch. 7. Superior maxillary. 8. Inferior maxillary. 9. Frontal branch. 10. Lachrymal. 11. Nasal. 12. Internal nasal. 13. External nasal. 14. External and internal frontal. 15. Infra-orbitary. 16. Posterior dentals. 17. Middle dental. 18. Anterior dental. 19. Labial and palpebral branches of the infra-orbital. 20. Orbitar. 21. Pterygoid. 22. Masseter, temporal, pterygoid, and buccal branches. 23. Lingual branch, joined at an acute angle by the chorda tympani. 24. Inferior dental, terminating in 25. Mental branches. 26. Superficial temporal. 27. Auricular branches. 28. Mylo-hyoid branch.

Fig. 91.



TRIFACIAL NERVES.

Fifth Pair—Trifacial; the largest cranial nerves, and the principal nerves of sensation of the head and face, arise, like the spinal nerves, from two roots.

Each trifacial commences in a tract of yellowish matter in front of the floor of the fourth ventricle, and passing forward through an opening in the border of the tentorium, near the extremity of the petrous bone, spreads out into a large semilunar ganglion, called *Casserian*, the anterior root, which is much the smallest, merely lying against the under surface, but not forming a part of the ganglion. This ganglion divides into the ophthalmic, superior maxillary, and inferior maxillary branches.

The *ophthalmic nerve* is a short trunk, three fourths of an inch long; it passes out at the sphenoidal foramen, and divides into three branches; the *frontal* passes through the supra-orbiter foramen to the integument of the forehead, supplying also the conjunctiva and upper eyelid; it gives off a *supra-trachlear* branch to the inner angle of the eye and root of the nose. The *lachrymal* is the smallest branch, and is distributed to the lachrymal gland, temple, cheek, and inner portions of the orbit. The nasal passes forward between the two heads of the external rectus muscle, and enters the nose by the opening at the side of the crista galli, where it divides into an *internal* branch, supplying the anterior part of the mucous membrane, and an *external*, distributed to integuments at the extremity of the nose. Within the orbit the nasal nerve gives off a *ganglionic* branch, which forms the superior long root of the ciliary ganglion, *ciliary branches* to the iris, and an *infra-trochlear* to the lachrymal sac, caruncula lachrymalis, conjunctiva, and inner angle of the orbit.

The *superior maxillary nerve* passes through the foramen rotundum, crosses the spheno-maxillary fossa, enters the canal in the floor of the orbit, emerges on the face through the infra-orbital foramen, where it divides into several branches, distributed to the lower eyelid and conjunctiva, muscles, and integument of the upper lip, nose, and cheek, forming a plexus with the facial nerves. The *orbital* branch traverses the infra-orbital canal, and enters the orbit at the infra-orbital foramen, where it divides into a *temporal* branch, which passes through a canal in the malar bone to supply the integuments of the temple region, and a *malar* branch, which emerges upon the cheek through an opening in the malar bone, to communicate with branches of the infra-orbital and facial nerves. Two branches ascend from Meckel's ganglion, and join the orbital nerve as it crosses the spheno-maxillary fossa, called pterygo-palatine. The *posterior dental* branches pass through small foramina in the back surface of the upper jaw, and run forward to the base of the alveolus, supplying the back teeth and gums. The *middle* and *anterior dental* branches descend to the corresponding teeth and gums; previously to their distribution the dental nerves form a plexus in the outer wall of the upper maxillary bone, above the alveolus, from which

filaments are given off to the pulps of the teeth, gums, mucous membrane of the nose, and palate.

The Inferior Maxillary Nerve is the largest division of the fifth pair; it emerges at the foramen ovale, and divides into external and internal trunks. The *external* divides into five branches—the *masseteric*, two *temporal*, *buccal*, and *internal pterygoid*, all of which are distributed to the muscles of the temporal and maxillary regions; the last-named branch is connected by filaments with the otic ganglion. The *internal* trunk divides into three branches; the *gustatory*, which is distributed by numerous filaments to the papillæ and mucous membrane of the tongue; the *inferior dental*, which proceeds to the dental foramen, which it enters, and runs along the canal of the lower jaw, supplying the teeth and gums, and terminating in two branches; *incisive*, which goes to the front teeth; and *mental*, which passes out at the mental foramen, to be distributed to the muscles and integuments of the chin and lower lip; the inferior dental gives off a *mylo-hyoidean* branch to the mylo-hyoid and digastric muscles; and the *anterior auricular*, which originates by two roots, passes backward behind the articulation of the lower jaw, where it forms a plexus, from which an *ascending* or *temporal* branch is given off to the temporal region, and a *descending* branch, which supplies the parotid gland and external parts of the ear, supplying a few filaments to the tympanum.

Sixth Pair—Abducentes; nerves of motion; each arises from the corpus pyramidale, proceeds forward parallel with the basilir artery, and, ascending, passes through the cavernous sinus; entering the orbit through the sphenoidal fissure to be distributed to the external rectus muscle. A palsy of this nerve produces internal squinting.

Seventh Pair—Facial and Auditory; nerves of motion; the seventh pair consists of two nerves; the smaller and internal is the *facial*, or *portio dura*, arising from the corpus restiforme; the larger and external is the *auditory*, or *portio mollis*, arising from the calamus scriptorius. The *facial nerve* enters the meatus auditorius internus along with the auditory, passes through the canal called aqueduct of Fallopius, and emerges at the stylo-mastoid foramen, then penetrates the parotid gland, and at the ramus of the lower jaw divides into *temporo-facial* and *cervico-facial* trunks, which split into numerous branches, forming looped communications, called *pes anserinus*, to be distributed upon the side of the face from the temple to the neck; in its course it communicates extensively with the neighboring branches of nerves; it also sends off the following branches: *tympanitic*, to the stapedius muscle; *chorda tympani*, to the tympanum, which it crosses, and, passing through the fissura Glasseri joins the gustatory nerve between the

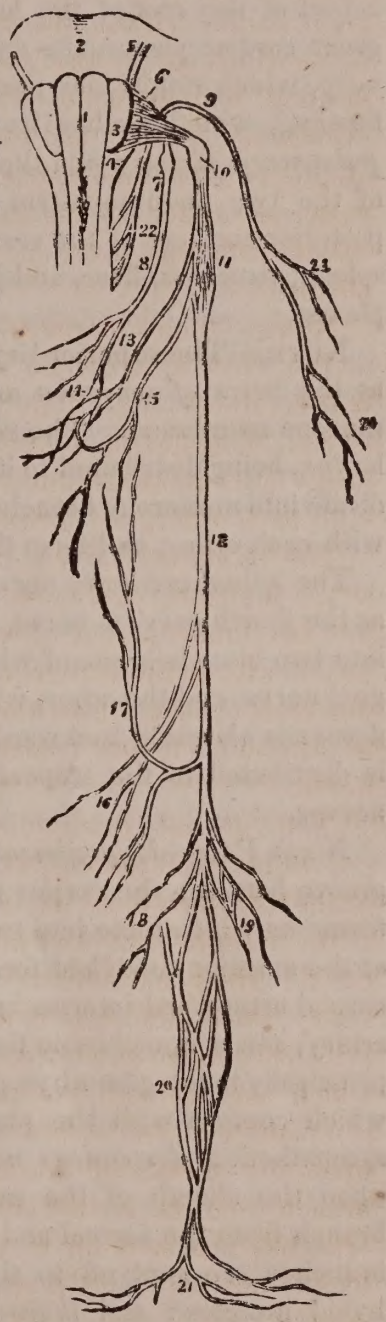
pterygoid muscles, with which it descends to the submaxillary ganglion; the *posterior auricular*, to the muscles of the ear; the *stylo-hyoid* and *digastric*, to those muscles. The *auditory nerve* divides at the bottom of the meatus into *cochlear* and *vestibular* branches, which are distributed to the internal ear.

Eighth Pair; consists of three nerves; glosso-pharyngeal, pneumogastric, and spinal accessory, which some authors reckon as the ninth, tenth, and eleventh pairs.

The *glosso-pharyngeal nerve* arises from the groove between the corpus olivare and restiforme, emerges at the foramen lacerum posterius, and curves forward to be distributed to the mucous membrane of the base of the tongue and fauces, tonsils, and mucous glands of the mouth. Within the jugular fossa it presents a ganglionic enlargement, called *ganglion jugulare;* near its origin is also a small ganglion, called *petrosal*, or *Anderschian*. Its branches are: *Communicating*, which proceed from the petrosal ganglionic plexus, and, in common with those of the facial and sympathetic, form a complicated plexus at the base of the skull; *tympanitic* (Jacobson's nerve), which proceeds from the petrosal ganglion, and, entering the bony canal in the jugular fossa, divides into six branches, distributed upon the inner wall of the tympanum, forming a plexiform communication (tympanic plexus) with the sympathetic and fifth pair; it sends branches of *distribution* to supply the fenestra rotunda, fenestra ovalis, and Eustachian tube, and *communicating* branches to the carotid plexus, otic ganglion, and petrosal branch of the Vidian nerve; the *muscular*, which are sent to the stylo-pharyngeas, stylo-hyoid, and digastric muscles; the *pharyngeal*, which are distributed to the pharynx; the *lingual*, which go to the base of the tongue, fauces, and epiglottis; and the *tonsillitic*, which form a plexus around the base of the tonsils, and supply filaments to the fauces and soft palate.

The *pneumogastric nerve* arises immediately below the former, and emerges from the skull through the same foramen; soon after passing from the skull it enlarges into a ganglion, *plexus gangliformis*, nearly an inch in length, surrounded by an irregular plexus of white nerves which communicate with each other, with other divisions of the eighth pair, and with the trunk of the pneumogastric below. Descending to the root of the neck, the *right* pneumogastric passes between the subclavian artery and vein to the posterior mediastinum, then behind the root of the lung to the œsophagus, which it accompanies to the stomach. The *left* enters the chest parallel with the left subclavian artery, crosses the arch of the aorta, and descends behind the root of the lung and along the anterior surface of the œsophagus to the stomach.

Fig. 92



EIGHTH PAIR OF NERVES

In Fig. 92 is seen a representation of the origin and distribution of the eighth pair. 1, 3, 4. Medulla oblongata. 1 is the corpus pyramidale of one side. 3. Corpus olivare. 4. Corpus restiforme. 2. Pons Varolii. 5. Facial nerve. 6. Origin of the glosso-pharyngeal. 7. Ganglion of Andersch. 8. Trunk of the nerve. 9. Spinal accessory nerve. 10. Ganglion of the pneumogastric. 11. Its plexiform ganglion. 12. Its trunk. 13. Its pharyngeal branch forming the pharyngeal plexus (14), assisted by a branch from the glosso-pharyngeal (8), and one from the superior laryngeal (15). 16. Cardiac branches. 17. Recurrent laryngeal branch. 18. Anterior pulmonary branches. 19. Posterior pulmonary branches. 20. Œsophageal plexus. 21. Gastric branches. 22. Origin of the spinal accessory. 23. Its branches distributed to the sterno-mastoid muscle. 24. Its branches to the trapezius muscle.

The branches of the pneumogastric are: *Communicating*, which connect with the facial, glosso-pharyngeal, spinal accessory, hypo-glossal, and sympathetic; *auricular*, which passes through a small canal in the petrous portion of the temporal bone to the pinna, sending filaments to the facial; *pharyngeal*, which assists to form, on the middle constrictor muscle, the pharyngeal plexus, which is distributed to the muscles and mucous membrane of the pharynx; the *superior laryngeal*, distributed to the arytenoideus muscle and mucous membrane of the larynx, communicating behind the cricoid cartilage with the recurrent laryngeal, and giving off the *external laryngeal*, which sends a twig to the pharyngeal plexus, and supplies the inferior constrictor and circo-thyroid muscles and thyroid gland; *cardiac*, two or three branches which cross the lower part of the common carotid, to communicate with the cardiac branches of the sympathetic, and with the great cardiac plexus; *recurrent laryngeal*, which passes upward from near the pulmonary branches to the larynx, giving off branches to the heart, lungs, œsophagus, and trachea, and is distributed to all the muscles of the larynx, except the circo-hyroid, communicating with the superior and external laryngeal and

sympathetic nerves; *anterior pulmonary*, distributed to the anterior aspect of the root of the lungs, and forming, with the branches of the great cardiac plexus, the *anterior pulmonary* plexus; *posterior pulmonary*, which supply the posterior aspect of the root of the lungs, and forming, with branches from the great cardiac plexus, the *posterior pulmonary plexus;* and the *gastric*, which are the terminal filaments of the two pneumogastric nerves, spread out upon the anterior and posterior surfaces of the stomach, and also distributed to the omentum, spleen, pancreas, liver, and gall-bladder, communicating with the solar plexus.

NOTE.—The superior laryngeal nerve is regarded by some anatomists as the *nerve of sensation* to the larynx, being distributed mainly to its mucous membrane. The recurrent is the proper motor nerve of the larynx, being distributed to its muscles. The two pneumogastric nerves divide into numerous branches upon the œsophagus, which communicate with each other, and form the *œsophagal plexus.*

The *spinal accessory* nerve arises from the spinal cord as low down as the fourth cervical nerve, escapes at the jugular foramen, and divides into two branches, one of which sends filaments to the superior pharyngeal nerve, and the other, which is the proper continuation of the nerve, descends obliquely backward, and piercing the sterno-mastoid muscle, is distributed to the trapezius, communicating with the upper cervical nerves.

Ninth Pair—Hypoglossal; nerves of motion; each arises from the groove between the corpus pyramidale and corpus olivare, by numerous filaments which unite into two bundles, and emerge from the cranium at the anterior condyloid foramen; then passing between the internal carotid artery and internal carotid vein, and curving around the occipital artery, sends branches to the muscles of the tongue, being distributed principally to the genio-hyo-glossus. Its branches are: *communicating*, which connect with the pneumogastric spinal accessory, cervical and sympathetic; *descendens noni*, a long, slender twig which descends upon the sheath of the carotid vessels, forming a loop with a long branch from the second and third cervical, from the convexity of which branches are sent off to the sterno-hyoid, sterno-thyroid, and omo-hyoid muscles; and *thyro-hyoidean*, distributed to the thyro-hyoid muscle.

THE SPINAL NERVES.—Of these there are thirty-one pairs, each arising by two roots, an anterior motor and a posterior sensitive; the posterior are larger, and have more numerous filaments than the anterior. In the intervertebral foramina the posterior roots enlarge into a

ganglion, after which both roots unite and form a spinal nerve which passes out of the foramen, and then divides into an *anterior* branch, which supplies the front portion of the body, communicating with the ganglions of the sympathetic, and forming plexuses which give off the principal nerves to the muscles of the trunk and extremities, and a *posterior*, which supplies the muscles of the back. The spinal nerves are divided into *cervical*, *dorsal*, *lumbar*, and *sacral*

Cervical Nerves.—Eight pairs: the first is called *sub-occipital;* it passes out of the spinal canal, between the occiput and atlas; and the last passes out between the last cervical and first dorsal vertebra. The anterior branches of the four upper form the *cervical plexus;* the posterior branches, *posterior cervical plexus.* The anterior branches of the four lower cervical, with the first dorsal, form the *brachial plexus.*

The *cervical plexus* sends off the following: *superficialis colli*, which divides into a *descending* branch, distributed to the integument on the side and front of the neck, and an *ascending* branch, which supplies the integument of the chin and lower parts of the face; *auricularis magnus*, the largest of the ascending branches, which divides at the parotid gland into an *anterior* branch, distributed to the gland, adjacent integument, and external ear, and a *posterior*, which pierces the parotid gland, crosses the mastoid process, and is then divided into branches to supply the integument of the side of the head and back part of the pinna, sending off several facial branches to the cheek; *occipitalis minor*, which arises from the second cervical, and is distributed to the muscles and integument of the external ear and occipital region; *acromiales* and *claviculares*, two or three large branches distributed to the integument of the upper and front part of the chest; *communicating*, filaments which connect with the sympathetic, pneumogastric, and hypoglossal; *muscular*, distributed to the trapezius, levator anguli, scapulæ, and rhomboidei muscles; *communicans noni*, a long, slender branch forming a loop with the descendens noni over the sheath of the carotid vessels; and *phrenic* (the internal respiratory of Charles Bell), which descends to the root of the neck, crosses the subclavian artery, and enters the chest between it and the subclavian vein, passes through the middle mediastinum and in front of the root of the lung to the diaphragm, to which it is distributed, its filaments communicating with the phrenic, solar, and hepatic plexuses.

The *posterior cervical plexus* gives off *musculo-cutaneous* branches to the ligamentum nuchæ, integument of the back part of the neck, and posterior region of the scalp; and the *occipitalis major*, which is distributed to the muscles of the neck and integument of the scalp.

The *brachial plexus* is broad in the neck, narrowing as it descends into the axilla, enlarging again at its lower part, where it divides into six terminal branches, which are distributed to the upper extremity and chest. From the plexus are sent off *superior muscular* branches to the subclavius and rhomboidei muscles, *short thoracic* to the two pectora and deltoid muscles, *long thoracic* (external respiratory of Bell) to the serratus magnus muscle, *supra-scapular* to the supra-spinatis and infra-spinatis muscles, *subscapular* to the subscapularis muscle, and *inferior muscular* to the latissimus dorsi and teres major. The terminal branches are: the *external cutaneous*, which, piercing the coraco-brachialis muscle, passes between the biceps and brachialis anticus to the outer side of the elbow, where it perforates the fascia, and divides into two branches; the *external* follows the course of the radial vein, communicating with branches of the radial nerve on the back of the hand, and supplying the coraco-brachialis, biceps, brachialis anticus, and integuments on the outer side of the fore-arm; the *internal cutaneous*, which passes down the inner side of the arm with the basilic vein, piercing the deep fascia about the middle of the upper arm, and dividing into two branches; the *anterior* descends along the palmarus longus to the wrist, supplying the integument in its course; the posterior supplies the integument over the olecranon and inner condyle, and descends the fore-arm along the ulnar vein to the wrist, supplying the integument on the inner side of the fore-arm; the *lesser internal cutaneous*, a long, slender branch which descends on the inner side of the external cutaneous to be distributed to the integument of the elbow; the *median*, which arises by two heads, embracing the axillary artery, crosses the brachial artery at its middle, descends to the inner bend of the elbow, runs down the fore-arm between the flexor sublimis and profundus, and beneath the annular ligament into the palm of the hand, where it divides into *muscular*, *anterior interosseous*, *superficial palmar*, and *digital* branches, to be distributed to the structures of the fore-arm, wrist, and fingers; the *ulnar*, which arises with the internal head of the median, runs down the inside of the arm to the groove between the internal condyle and olecranon, where it is superficial and easily compressed—giving rise to the painfully thrilling sensation along the inside of the fore-arm and little finger when a blow is made on it against the inner condyle—after which it descends along the inner side of the fore-arm, crosses the annular ligament, and divides into *superficial palmar* and *deep palmar* branches, which, with *muscular*, *articular*, and *anastomotic* branches given off along its course, are distributed to the structures of the arm, fore-arm, wrist, and hand, and communicate with the other surrounding branches of nerves; the *musculo-spira-*

nerve, the largest branch of the brachial plexus, which descends in front of the tendons of the latissimus dorsi and teres major muscles, winds around the humerus in the spiral groove, and passes to the elbow, where, after sending off *muscular* branches, and the *spiral cutaneous* to the nerves, muscles, and integument in its course, it divides into the *posterior interosseous* and *radial* branches; the *radial* runs along the radial side of the fore-arm, and about two inches above the wrist penetrates the deep fascia, and divides into *external* and *internal* branches, which are distributed to the hands and fingers; the *interosseous* supplies all the muscles on the posterior aspect of the fore-arm, and a descending branch of it forms a large gangliform swelling on the back of the wrist, from which branches are distributed to the joint; and the *circumflex nerve*, which arises with the former, winds around the neck of the humerus with the posterior circumflex artery, and terminates in numerous branches, distributed to the deltoid muscle, after sending off *muscular* and *cutaneous* branches to the muscles and integuments of the shoulder and arm.

The Dorsal Nerves.—There are twelve pairs of dorsal nerves. Each nerve, as it emerges from the intervertebral foramen, divides into *dorsal* and *intercostal* branches. The *dorsal* pass backward between the transverse processes of the vertebræ, where each divides into a *muscular* and a *musculo-cutaneous* branch, distributed to the muscles and integument of the back; the *intercostal* branches, which are the true *intercostal nerves*, receive filaments from the adjoining ganglia of the sympathetic, and pass forward with the intercostal vessels in the intercostal spaces, supplying the intercostal muscles in their course; near the sternum they pierce the intercostal and pectoral muscles, supply the mammary glands, and are finally distributed to the muscles and integument in front of the chest and abdomen.

The Lumbar Nerves.—Of these there are five pairs; the first passes out between the first and second lumbar vertebræ, and the last between the lower lumbar vertebra and sacrum. At their origin the *anterior* branches communicate with the lumbar ganglia of the sympathetic, and pass obliquely outward behind the psoas magnus muscle, where they intercommunicate and anastomose to form the *lumbar plexus*. The *posterior* branches divide into *internal* branches, which are distributed to the adjacent muscles and integuments, and *external*, which intercommunicate, and, after supplying the deep muscles, are distributed to the integument of the gluteal region. The *lumbar plexus* gives off the following branches: 1. *Musculo-cutaneous*; which

divides into a *superior* branch, and this, after winding around the crest of the ilium, divides into *abdominal* and *scrotal* branches, the former of which is distributed to the integument of the groin and around the pubis, and the latter accompanies the spermatic cord in the male, and round ligament in the female, to supply the integument of the scrotum and internal labium; and an *inferior* branch, which passes along the spermatic cord, to be distributed to the genital organs. 2. *External cutaneous;* which passes into the thigh beneath Poupart's ligament, and divides into a *posterior* branch, which supplies the integument of the thigh, and an *anterior* branch, which is distributed to the integument on the outer border of the thigh and to the articulation of the knee. 3. *Genito-crural;* which runs on the anterior surface of the psoas magnus muscle to near Poupart's ligament, where it divides into a *genital* branch, which descends along the spermatic canal, to be distributed to the spermatic cord and cremaster muscle in the male, and the round ligament and external labium in the female, and a *crural* branch, which enters the sheath of the femoral vessels, and is distributed to the anterior aspect of the thigh. 4. *Crural, or femoral;* the largest division of the lumbar plexus is formed by the union of branches from the second, third, and fourth lumbar nerves, passes into the thigh beneath Poupart's ligament, then spreads out and divides into numerous branches: a. *cutaneous*, two nerves which perforate the sartorius muscle, and are distributed to the integument of the middle and lower part of the thigh and knee; b. *muscular*, round, large twigs, distributed to the muscles of the anterior aspect of the thigh, sending filaments to the periosteum and knee joint; c. *aponeurotic*, to the sheath of the femoral vessels and adjacent muscles; d. *short saphenous*, which divides at the sheath of the femoral vessels into a *superficial* branch, which runs down to the knee joint, and terminates by communicating with the long saphenous nerve, and a *deep* branch, which divides at the termination of the femoral artery into several filaments, which communicate with other nerves to form a plexus, some of whose filaments are distributed to the integument on the posterior part of the thigh; e. *long saphenous*, which enters the femoral sheath, and descends along the inside of the leg with the internal saphenous vein, crosses in front of the inner ankle, and is distributed to the integument on the inner side of the foot. In its course it receives a communicating branch from the obturator, near the division of the femoral artery, and another at the internal condyle, and gives off a *femoral cutaneous* branch, a *tibial cutaneous* branch, and an *articular* branch, to the integument of the inner and back part of the thigh, the inner aspect of the leg, around the knee joint the front and outer aspect of the leg, and the ankle joint. 5. *Obturator;* formed

by a branch from the third and another from the fourth lumbar nerve, passes through the angle of bifurcation of the common iliacs, and along the brim of the pelvis to the obturator foramen, where it joins the obturator artery. After emerging from the pelvis it gives off twigs to the obturator externus muscle, and divides into four branches; *three anterior*, which supply the adductor brevis, pectineus, adductor longus, and gracilis muscles, and a posterior which ramifies in the adductor magnus; from the anterior branches a *communicating* filament proceeds to unite with the long saphenous, and a *long cutaneous* branch descends to the inner side of the knee, where it communicates with the long saphenous; and from the posterior branch an *articular* branch is given off, which accompanies the popliteal artery, to be distributed to the back part of the synovial membrane of the knee joint. 6. *Lumbar sacral;* descends over the base of the sacrum into the pelvis, and forms a part of the sacral plexus.

The Sacral Nerves.—There are six pairs of sacral nerves; the first pass out of the vertebral canal through the first sacral foramina, and the two last between the sacrum and coccyx. The posterior are very small, and are distributed to the integument over the sacrum and coccyx and gluteal region. The *anterior* diminish in size from above downward; they are distributed to the muscles and integuments around the coccyx and anus; many of their branches are connected in the formation of the sacral plexus; they send communicating branches to the hypogastric plexus, and receive branches from the sacral ganglia of the sympathetic.

The Sacral Plexus.—The sacral plexus is formed by the lumbo sacral and anterior branches of the four upper sacral nerves. It is triangular in form, its base corresponding to the sacrum, and its apex to the lower part of the great ischiatic foramen. Its branches are: 1. *Visceral;* three or four branches, which ascend by the rectum and bladder in the male, and in the female upon the side of the rectum, the vagina, and bladder, supplying those viscera, and communicating with the hypogastric plexus. 2. *Internal muscular;* given off within the pelvis; an *obturator* branch to the obturatus internus, a *coccygeal* branch, and a *hæmorrhoidal* nerve, which descends to the rectum, supplying the sphincter and integument. 3. *External muscular;* several branches, distributed to the capsule of the hip joint and surrounding muscles. 4. *Gluteal;* passes out of the pelvis with the gluteal artery, and divides into a *superior* branch, which goes to the gluteus medius and minimus, and an *inferior*, which is distributed with the

above, and also to the tensor vaginæ femoris. 5. *Internal pudic*, passes out of the pelvis with the former, and divides, beneath the obturator fascia, into a *superior* branch *(dorsalis penis)*, which accompanies the dorsal artery of the penis to the glans, and is there distributed, supplying filaments to the corpus cavernosum, integument, and prepuce, and an *inferior* branch *(perineal nerve)*, which supplies the scrotum, and sends branches to the integuments of the under part of the penis, prepuce, sphincter ani, transversus perinei, and accelerator urinæ, and terminates by ramifying in the corpus spongiosum. In the female the internal pudic is distributed to the parts analogous to those of the male; the *superior* branch supplies the clitoris, and the inferior the vulva and parts in the perineum. 6. *Lesser ischiatic;* passes out of the pelvis through the great ischiatic foramen, and divides into *muscular* branches *(inferior gluteal)*, which are distributed to the gluteus maximus; and *cutaneous*, which send ascending filaments to the gluteal integument; the *perineal cutaneous nerve*, down the inside of the testis to the scrotum and integument on the under side of the penis; and the *middle posterior cutaneous*, which is distributed to the integuments of the thigh and leg at the middle of the calf. 7. *Great ischiatic;* this is the largest nervous cord in the whole body. It is a prolongation of the sacral plexus, and measures, at its exit from the great sacro-ischiatic foramen, three fourths of an inch in breadth. It descends between the trochanter major and tuberosity of the ischium, and along the back part of the thigh to its lower third, where it divides into terminal branches, called *popliteal* and *peroneal*. Previous to its division it sends off *muscular* branches to the semi-tendinous, semi-membranosus, and adductor magnus, and *articular* branches, which descend to be distributed to the capsule and synovial membrane of the knee joint.

The *popliteal nerve* passes down externally to the vein and artery, and after sending off *muscular* branches to the gastrocnemius, soleus, plantaris, and popliteus, an *articular* to the interior of the knee joint, and a *communicating*, a large nerve descending between the heads of the gastrocnemius, and forming below the knee, with a connecting branch from the peroneal nerve, the external saphenous nerve, it becomes the *posterior tibial*. The *external saphenous* penetrates the deep fascia below the fleshy part of the gastrocnemius, and passes down the leg along the outer border of the tendo-Achillis, winds around the outer malleolus, and is distributed to the outer side of the foot and little toe, sending numerous filaments to the integument of the heel and sole of the foot.

The *posterior tibial nerve* continues along the back of the leg from the lower border of the popliteus muscle to the back of the inner ankle, where it divides into the interna and external plantar nerve; in its

course it sends *muscular* branches to the deep muscles, one or two filaments which entwine around the fibular artery, and then terminate in the integument, and *plantar* cutaneous branches, which pass down the inner side of the os calcis, to be distributed to the integument of the heel.

The *internal plantar nerve* crosses the posterior tibial vessels, to enter the sole of the foot, and is distributed to the toes, integument, and tarsal and metatarsal articulations.

The *external plantar nerve* is smaller than the former, and is distributed to the outer side of the foot, the little toe, and outer side of the second.

The *peroneal nerve* passes down by the tendon of the biceps, crosses the head of the gastrocnemius to the neck of the fibula, where it divides into the anterior tibial and musculo-cutaneous.

The *anterior tibial nerve* descends the anterior aspect of the leg with the artery to the ankle, where it passes beneath the annular ligament, and accompanies the dorsalis pedis artery to supply the adjoining sides of the great and second toes, distributing, in its course, filaments to the muscles and articulations of the tarsus and metatarsus.

The *musculo-cutaneous nerve* passes downward in the direction of the fibula, and at the lower third of the leg, where it pierces the deep fascia, and divides into two *peroneal cutaneous* branches, which pass in front of the ankle joint, to be distributed to the integument of the foot and toes, after sending filaments to adjacent muscles, and communicating branches to the saphenous and anterior tibial nerves.

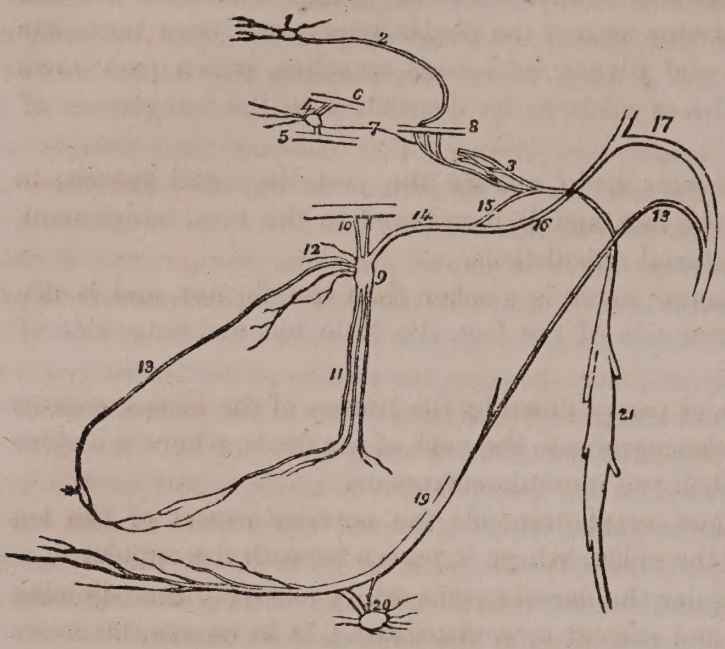
THE ORGANIC NERVES.

The organic nerves, commonly called the sympathetic or ganglionic system, consist of a series of ganglia extending along both sides of the vertebral column, which distribute branches to all the internal organs and viscera, and communicate with all the other nerves of the body.

The branches of distribution accompany the arteries which supply the different organs, and form communications around them called *plexuses*, which are named after the arteries, as mesenteric, hepatic, splenic, etc., plexuses.

Cranial Ganglia.—There are five ganglia in the head: 1. *Ganglion of Ribes*, situated upon the anterior communicating artery; it is the superior point of union between the chains of opposite sides of the body. 2. *Ciliary ganglion*, a small, flattened body within the orbit, between the optic nerve and external rectus muscle; its branches of distribution supply the coats of the eye.

Fig. 93.



CRANIAL GANGLIA.

Fig. 93 is a representation of cranial ganglia of the organic system. 1. Ganglion of Ribes. 2. A filament by which it communicates with the carotid plexus (3). 4. Ciliary or lenticular ganglion, giving off ciliary branches to the globe of the eye. 5. Part of the inferior division of the third nerve, receiving a short, thick branch (the short root) from the ganglion. 6. Part of the nasal nerve, receiving a longer branch (the long root) from the ganglion. 7. A slender filament (the sympathetic root), sent directly backward from the ganglion of the carotid plexus. 8. Part of the sixth nerve in the cavernous sinus, receiving two branches from the carotid plexus. 9. Meckel's ganglion (spheno-palatine). 10. Its ascending branches, communicating with the superior maxillary nerve. 11. Its descending, or palatine branches. 12. Its internal branches, spheno-palatine, or nasal. 13. The naso-palatine branch, one of the nasal branches. 14. Posterior branch of the ganglion, the Vidian nerve. 15. Its carotid branch communicating with the carotid plexus. 16. Its petrosal branch, joining the intumescentia gangliformis of the facial nerve. 17. Facial nerve. 18. Chorda tympani, which descends to join the gustatory. 19. Gustatory nerve. 20. Submaxillary ganglion, receiving the corda tympani and other filaments from the gustatory. 21. Superior cervical ganglion of the sympathetic.

3. *Spheno-palatine ganglion* (Meckel's), the largest of the cranial ganglia, situated in the spheno-maxillary fossa. Its branches of distribution are: *nasal*, or *spheno-palatine*, four or five in number, which enter the nasal fossa through the spheno-palatine foramen, and supply the mucous membrane and spongy bones of the nose, and the upper part of the pharynx and the Eustachian tube; the *naso-palatine* to the septum of the nose and palate; the *anterior palatine* to the hard palate, bones of the nose, and the antrum; the *middle palatine* to the tonsil, soft palate, and uvulva; and the *posterior palatine* to the hard palate, gums, tonsil, and soft palate. Its communicating branches join the superior maxillary abducens, and optic nerves, and the ciliary ganglion. The *posterior* branch is the *Vidian* or *pterygoid* nerve, which passes to the foramen lacerum, and divides into *carotid* and *petrosal* branches to the carotid plexus and the gangliform enlargement of the facial nerve.

it also sends a filament to the otic ganglion. 4. *Otic ganglion* (Arnold's) is a small, oval ganglion, situated on the inferior maxillary nerve, immediately below the foramen ovale. It sends off two branches of distribution, one to the tensor palati muscle, and one to the tensor tympani, and branches of communication to the auricular, chorda tympani, nervi molles, facial, and Vidian nerves, and the facial and Casserian ganglions. 5. *Submaxillary ganglion*, a small, triangular ganglion upon the submaxillary gland; it sends branches of distribution to the gland and Wharton's duct, and communicating branches to the gustatory, facial, and nervi molles.

The Carotid Plexus.—The *carotid plexus* is formed of the divisions of the ascending branch of the superior cervical ganglion in the carotid canal, where they form several loops with each other around the artery, together with branches derived from the petrosal branch of the Vidian. The continuation of this plexus onward by the side of the sella turcica is called the *cavernous plexus*. It is the centre of communication between all the cranial ganglia, and being derived from the superior cervical ganglion, between the cranial ganglia and those of the trunk, it also communicates with most of the cerebral nerves, and distributes filaments with each of the branches of the internal carotid, which accompany those branches in all their ramifications.

Cervical Ganglia.—The cervical ganglia are three in number on each side. 1. *Superior cervical;* a long, grayish-colored ganglion, extending from within an inch of the carotid foramen in the petrous bone to the third cervical vertebra. It sends a *superior* branch to the carotid canal, whose divisions and intercommunications with each other, and with the petrosal branch of the Vidian, constitute the carotid plexus before described; an *inferior* or descending branch to the middle cervical; numerous *external* branches to the glosso-pharyngeal, pneumogastric, hypoglossal, and the first three cervical nerves; three *internal* branches, to the pharyngeal plexus, superior laryngeal nerve, and superior cardiac nerve; and *anterior* branches, called from their softness *nervi molles*, which accompany the carotid artery with its branches, around which they form intricate plexuses, and occasionally small ganglia. 2. *Middle cervical* (thyroid ganglion); of small size, situated opposite the fifth cervical vertebra, and resting on the inferior thyroid artery. It sends a *superior* branch to the superior cervical ganglion; *inferior* branches to the inferior cervical ganglion; *external* branches to the third, fourth, and fifth cervical nerves; and *internal* branches to the inferior thyroid plexus and artery, and middle cardiac nerve.

Fig. 94.

GANGLIONIC SYSTEM.

In Fig. 94 is presented a view of the organic or sympathetic system. A A A A. Semilunar ganglion and solar plexus. B. Small splanchnic nerve. C. Great splanchnic nerve. D D D. Thoracic ganglion. E. Internal branches. F. External branches. G. Right coronary plexus. H. Left coronary plexus. I. Inferior cervical ganglion. J. Inferior twigs. K. External threads. L. Internal twigs. M. Anterior threads. N. Middle cervical ganglion. O. Interior twigs. P. External twigs. Q. Superior cervical ganglion. R. Superior branches. S. Inferior branch. T. External branches. U. Submaxillary gland. V. Vidian nerve. W. Naso-palatine branch. X. Spheno-palatine ganglion. Y. Ophthalmic ganglion. Z. Auditory nerve. 1. Renal plexuses. 2. Lumbar ganglia. 3. Internal branches. 4. External branches. 5. Aortic plexus

3. *Inferior cervical*; of a semilunar form, situated upon the base of the transverse process of the seventh cervical vertebra, and hence called "*vertebral ganglion*." It sends *superior* branches to the middle cervical ganglion; *inferior*

to the first thoracic ganglion; *external* to the dorsal nerves and vertebral plexus; and *internal* branches to the inferior cardiac nerve.

The Cardiac Nerves.—The *superior cardiac* arises from the lower part of the superior cervical ganglion, and, descending the neck, passes behind the arteria innominata, and joins the *cardiac ganglion* below the arch of the aorta, receiving in its course branches from the pneumogastric, and sending filaments to the thyroid gland and trachea. The *middle cardiac* proceeds from the middle cardiac ganglion; it is the largest of the three nerves, and at the root of the neck divides into several branches, and communicates with the superior and inferior cardiac, the pneumogastric, and recurrent nerves, and descends to the *great cardiac plexus* at the bifurcation of the trachea. The *inferior cardiac* arises from the inferior cervical ganglion, communicates with the recurrent laryngeal and middle cardiac, and descends to the great cardiac plexus.

The *cardiac ganglion* is a variable enlargement beneath the arch of the aorta, which receives the superior cardiac nerves and a branch from the pneumogastric, and gives off numerous branches to the cardiac plexuses. The *great cardiac plexus* is situated upon the bifurcation of the trachea, above the right pulmonary artery, and behind the arch of the aorta; the *anterior cardiac plexus* is situated in front of the ascending aorta, near its origin; the *posterior cardiac plexus* rests upon the posterior part of the ascending aorta, near its origin. These plexuses intimately intercommunicate with each other and with the neighboring nerves, and supply the heart. Two sets of branches from the posterior cardiac constitute the *posterior coronary plexus;* and the *anterior* and *posterior pulmonary plexuses* are formed in part by branches from the great cardiac plexus.

Thoracic Ganglia.—There are twelve *thoracic* or *dorsal* ganglia on each side resting upon the head of the ribs; their form is irregular, but they present the peculiar gray color and pearly lustre of the other organic ganglia. They send *superior* and *inferior* branches, to communicate with the ganglia above and below, two or three *external* branches to the roots of each of the spinal nerves, *internal* branches to the pulmonary, œsophageal, and cardiac plexuses, and *splanchnic*, several large cords from the lower ganglion, which unite to form the *splanchnic nerve.*

The *great splanchnic nerve* arises from the sixth dorsal ganglion, and, receiving branches from the seventh, eighth, ninth, and tenth, descends in front of the vertebral column, within the posterior mediasti-

num, pierces the diaphragm, and terminates in the semilunar ganglion. The *lesser splanchnic* (renal) is formed by filaments from the three lower dorsal ganglia, pierces the diaphragm, and descends to join the *renal plexus*.

The *semilunar ganglion* is a large, irregular body, pierced by numerous openings, and appearing like an aggregation of smaller ganglia with intervening spaces. It is situated by the side of the cœliac axis, upon the aorta, and communicates with the ganglion of the opposite side, both above and below that trunk, forming a gangliform circle, from which branches pass off radiatingly in all directions; hence the entire circle is called the *solar plexus*. It is undoubtedly the *presiding centre*, or *great brain* of the organic system, and probably the starting point in the development of all organized beings. Various sensations usually referred to the heart have, no doubt, their source in this ganglion.

The *solar plexus receives* the great splanchnic and part of the lesser splanchnic nerves, the termination of the right pneumogastric, branches from the right phrenic, and sometimes filaments from the left, and *transmits* numerous filaments to accompany, as plexuses, all the branches given off by the abdominal aorta, being the *phrenic*, *gastric*, *hepatic splenic*, *supra-renal*, *renal*, *superior mesenteric*, *spermatic*, and *inferior mesenteric plexuses*, all derived from the solar plexus.

Lumbar Ganglia.—There are four lumbar ganglia on each side, situated upon the anterior part of the bodies of the lumbar vertebræ. Their *superior* and *inferior* branches communicate with the ganglia above and below; their *external* branches communicate with the lumbar nerves; and their *internal* branches interlace around the abdominal aorta, constituting the *lumbar aortic plexus*, and again over the promontory of the sacrum, forming the *hypogastric plexus*, which distributes branches to all the viscera of the pelvis.

Sacral Ganglia.—The *sacral ganglia* are four or five in number on each side, situated near the anterior sacral foramina. Their *superior* and *inferior* branches communicate with the ganglia above and below; the *external* with the sacral nerves; and the *internal* are distributed to the pelvic viscera, sending branches to the hypogastric plexus. The lower sacral ganglia give off branches which join the *azygos ganglion* on the coccyx, which connects the ganglionic system inferiorly, as the ganglion of Ribes does superiorly.

CHAPTER IX.

ORGANS OF THE EXTERNAL SENSES.

The organs of sense, which bring the animal machine into relation with external objects, are five; four of them, the apparatus of smell, sight, hearing, and taste, are situated within the head, while the organ of touch, resident in the skin, is distributed over the entire surface.

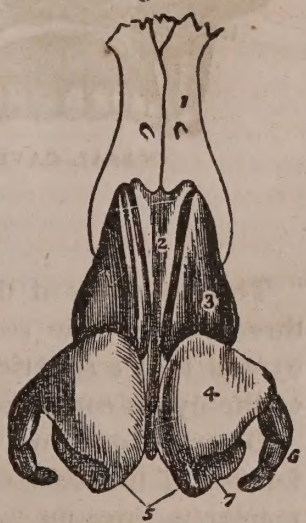
THE ORGAN OF SMELL.

The external parts of the organ of smell are called the *nose*, and the internal parts the *nasal fossæ*.

The Nose.—The anatomical parts of the nose are: The *nostrils*, which overhang the mouth, and are so constructed that the odors of all substances must be received by the nose before they can be introduced within the lips; the *columna*, or partition between the nostrils; the *vibrissæ*, stiff hairs which project across the openings, and guard their entrance; the fibro-cartilaginous *integument*, which forms the tip, called *lobulus*, and wings, called *alæ;* the *muscles*, already described; the *bones—nasal* and *nasal processes of the superior maxillary;* the *mucous membrane*, lining its interior; the *arteries*, from the facial and supra coronary; and the *nerves*, which are the facial, infra-orbital, and nasa branch of the ophthalmic.

Fig. 95 shows the fibro-cartilages of the nose. 1. One of the nasal bones. 2. Fibro-cartilage of the septum. 3. Lateral fibro-cartilage. 4. The alar fibro-cartilage. 5. Central portions of the alar fibro-cartilages, which constitute the columna. 6. Appendix of the alar fibro-cartilage. 7. Nostril.

Fig. 95.



NASAL CARTILAGES.

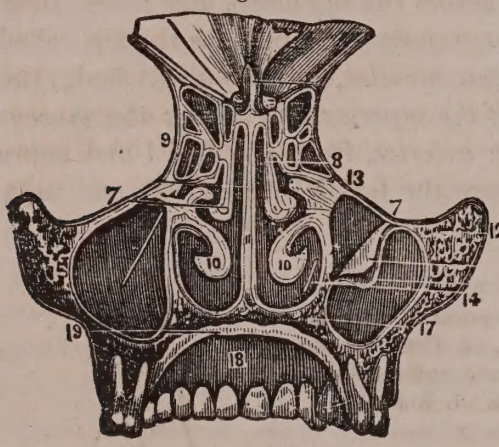
Nasal Fossæ.—The *nasal* fossæ are two irregular compressed cavities extending backward from the nose to the pharynx. They are bounded above by the lateral cartilage of the nose, and the nasal, sphenoid, and ethmoid bones; below by the hard palate. On the outer wall of each fossa are three projecting processes, called *spongy bones;* the two superior belong to the ethmoid, and the inferior is a separate bone; they increase the surface upon which the mucous membrane is spread out. The spaces between the upper and middle, the middle and lower, and lower and floor of the nostrils are the *superior*, *middle*, and *inferior meatuses*.

In the superior meatus are several openings into the nasal fossæ of the *sphenoidal* and *posterior ethmoidal cells;* in the middle the *anterior ethmoidal cells*, the *frontal sinuses*, and the *antrum maxillare;* and in the inferior the termination of the *nasal duct.*

The *mucous membrane* of the nasal fossæ is called *pituitary* or *Schneiderian;* it is continuous with the lining membrane of the gastro-pulmonary cavities, and extends into the sphenoidal and ethmoidal cells, frontal sinus, and antrum, through the nasal duct to the eye, where it is continuous with the conjunctiva; along the Eustachian tubes into the tympanum and mastoid cells, and through the posterior nerves into the pharynx and mouth, thence through the lungs and alimentary canal. Its surface is furnished with a delicate columna epithelium, supporting innumerable vibratile cilia.

The *arteries* of the nasal fossæ are the anterior and posterior ethmoidal branches from the ophthalmic, and the spheno-palatine and pterygo-palatine from the internal maxillary. The *nerves* are: The olfactory, the spheno-palatine branches from Meckel's ganglion, and the nasal branch of the ophthalmic. The ultimate filaments of the olfactory terminate in papillæ.

Fig. 96.



NASAL CAVITIES.

Fig. 96 is a vertical section of the middle part of the cavities of the nose. 7. Middle spongy bones. 8. Superior part of the nasal cavities. 10. Inferior spongy bones. 11. Vomer. 12. Upper jaw. 13 Middle meatus. 14. Inferior meatus 17. Palatine process of the upper jaw 18. Roof of the mouth, covered by mucous membrane. 19. A section of the mucous membrane.

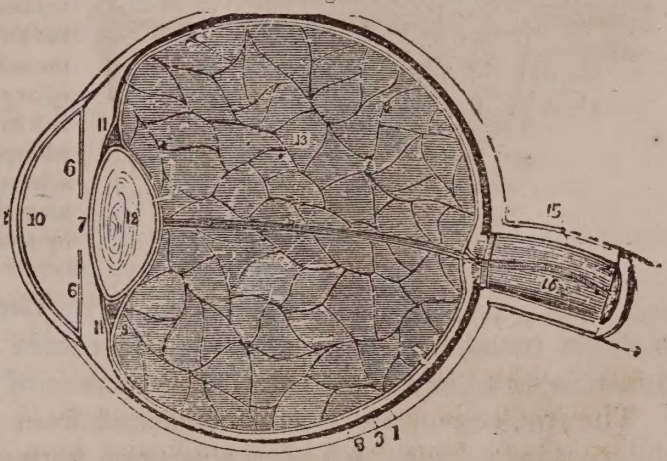
OF THE ORGAN OF SIGHT.

The structures of the visual organ may be conveniently divided into three classes: the *coats*, *humors*, and *appendages* of the eye. The eyeball is of a spherical form, about one inch in diameter. The globe of the eye is composed of three *coats*, or *tunics*, and three *humors*.

Outer Coat, or First Tunic.—The first coat of the eyeball is formed of the *sclerotic* and *cornea*. The sclerotic is a dark, fibrous membrane, investing about four fifths of the globe. Its anterior surface is covered with a tendinous layer, called the *tunica albuginea*, which is derived from the expansion of the tendons of the four recti muscles. A part of the tunica albuginea is covered by a mucous membrane

called the *conjunctiva*, which constitutes the "white of the eye." The sclerotic forms a thin, sieve-like plate, called *lamina cribrosa*, at the entrance of the optic nerve; this lamina is full of openings for the passage of nervous filaments. The largest of these openings in the centre is called the *porus opticus*, through which the *arteria centralis retinæ* —central artery of the retina—enters the eyeball. The cornea constitutes the anterior fifth of the globe. It is circular, transparent, and resembles a watch-glass. It is received into the grooved edge of the sclerotic in the manner that a watch-glass is received into its case. It is composed of four layers, the external being the white membrane, or conjunctiva, before mentioned.

Fig. 97.



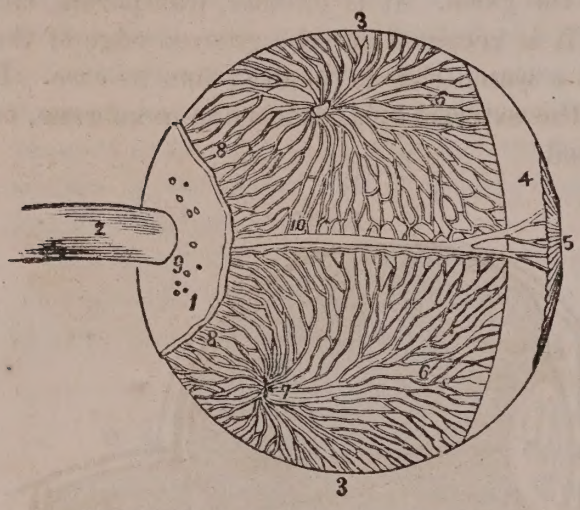
SECTION OF THE GLOBE

Fig. 97 is a longitudinal section of the globe of the eye. 1. The sclerotic, thicker behind than in front. 2. The cornea, received within the anterior margin of the sclerotic, and connected with it by means of a beveled edge. 3. The choroid, connected anteriorly with (4) the ciliary ligament, and (5) the ciliary processes. 6. The iris. 7. The pupil. 8. The third layer of the eye, the retina, terminating anteriorly by an abrupt border at the commencement of the ciliary processes. 9. The canal of Petit, which encircles the lens (12); the thin layer in front of this canal is the zonula ciliaris, a prolongation of the vascular layer of the retina to the lens. 10. The anterior chamber of the eye, containing the aqueous humor, the lining membrane by which the humor is secreted is represented in the diagram. 11 The posterior chamber. 12. The lens, more convex behind than before, and enclosed in its proper capsule. 13. The vitreous humor enclosed in the hyaloid membrane, and in cells formed in its interior by that membrane. 14. A tubular sheath of the hyaloid membrane, which serves for the passage of the artery of the capsule of the lens. 15. The neurilemma of the optic nerve. 16. The arteria centralis retinæ, imbedded in the centre of the optic nerve.

Middle Coat.—The second tunic is formed of the *choroid*, *ciliary ligament*, *iris*, and *ciliary processes*. The *choroid* is a vascular membrane, of a rich brown color externally, and of a deep black on its inner surface. Posteriorly it has an opening for the passage of the optic nerve; it is connected anteriorly with the iris, ciliary processes, and with the junction of the sclerotic and cornea, by a dense white structure, called the ciliary ligament, which surrounds the circumference of the iris, like a ring. The choroid membrane is composed

of three layers, the externa being principally an arrangement of veins called *venæ vorticosæ*. The middle layer is formed by the ramification of minute arteries. The internal layer is a delicate cellular structure, containing the *pigmentum nigrum*, or coloring matter of its posterior surface.

Fig. 98.



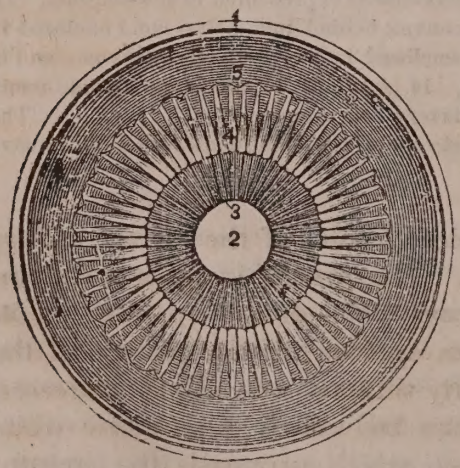
DISSECTION OF THE EYEBALL

Fig. 98 is a dissection of the eyeball, showing its second tunic, and the mode of the distribution of the venæ vorticosæ of the choroid. After Arnold. 1. Part of the sclerotic coat. 2. The optic nerve. 3 3. The choroid coat. 4. The ciliary ligament. 5. The iris 6 6. The venæ vorticosæ. 7 7. The trunks of the venæ vorticosæ at the point where they have pierced the sclerotica. 8 8. The posterior ciliary veins, which enter the eyeball in company with the posterior ciliary arteries, by piercing the sclerotic at 9. 10. One of the long ciliary nerves, accompanied by a long ciliary vein.

The *ciliary ligament* forms a circle round the iris, connecting the cornea and sclerotic at their junction with the iris and external membrane of the choroid.

The *iris*, or rainbow, is so denominated from its variety of colors in different individuals. It makes a partition between the front and back chambers of the eye, and has a circular opening near its centre, called the *pupil of the eye*. The iris is composed of two layers; the anterior is muscular, consisting of both circular fibres which surround the pupil, and radiating fibres from the centre to the circumference; the combined contraction of these fibres diminishes the diameter of the pupil.

Fig. 99.



ANTERIOR SEGMENT

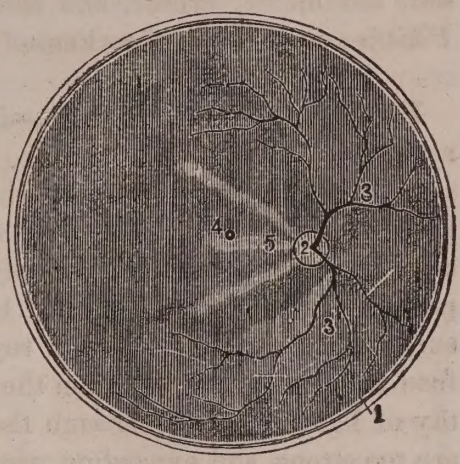
Fig. 99 is the anterior segment of a transverse section of the globe of the eye, seen from within. 1. The divided edge of the three tunics; sclerotic, choroid (the dark layer), and retina. 2. The pupil. 3. The iris, the surface presented to view in this section being the uvea. 4. The ciliary processes. 5. The scalloped anterior border of the retina.

The *ciliary processes* consist of

triangular folds of the middle and internal layers of the choroid. Their circumference connects with the ciliary ligament; they are covered with a thick black pigment.

Fig. 100 is the posterior segment of a transverse section of the globe of the eye, seen from within. 1. The divided edge of the three tunics. The membrane covering the whole internal surface is the retina. 2. The entrance of the optic nerve with the arteria centralis retinæ piercing its centre. 3 3. The ramifications of the arteria centralis. 4. Foramen of Soemmering, in the centre of the axis of the eye; the shade from the side of the section obscures the limbus luteus, which surrounds it. 5. A fold of the retina, which generally obscures the foramen after the eye has been opened.

Fig. 100.



POSTERIOR SEGMENT.

INNER COAT.—The third tunic is the *retina*. It is formed of three layers. The external is a mere *film;* the middle or *nervous* is the expansion of the optic nerve, enveloping the vitreous humor, and extending forward to the ciliary processes; the inner membrane is the *vascular*, composed of ramifications of arteries and veins. The anterior margin of the retina is connected with the anterior surface of the lens by a thin vascular layer, called *zonula ciliaris*. There is a circular spot in the retina, in the centre of the back part of the globe, called the *foramen of Soemmering*, surrounded by a yellowish halo, called *limbus luteus*.

HUMORS OF THE EYE.—The *aqueous humor* occupies the two chambers of the eye. The *anterior chamber* is the space bounded by the cornea in front, and the iris and pupil behind; the *posterior chamber* is the very small space between the pupil and posterior surface of the iris in front, and the ciliary processes, crystalline lens, and zonula ciliaris behind. Both chambers are lined by a thin membrane, which secretes the fluid of the aqueous humor, which does not exceed five or six drops in bulk.

The *vitreous humor* makes the greater part of the bulk of the globe of the eye. It is a glassy, transparent fluid, enclosed in a delicate membrane, called the *hyaloid*. The inner surface of the hyaloid is disposed in thin lamellæ or plates reflected inward, forming different apartments or cells, like the transverse section of an orange, for holding the vitreous humor.

The *crystalline humor*, or *lens* is situated behind the pupil, sur-

rounded by the ciliary processes, and embedded in the front part of the vitreous, from which it is separated by the hyaloid membrane. The *capsule of the lens* is an elastic, transparent membrane which surrounds it. The lens is formed of concentric layers, the external being soft, the middle firmer, and the interior still firmer. The *canal of Petit* is a small triangular channel around the circumference of the lens.

USES OF THE STRUCTURES.—The ocular group of muscles has already been described.

The firm sclerotic coat gives shape and form to the eye, and protects its complicated and delicate tissues. The transparent cornea furnishes a medium for the transmission of the rays of light. The choroid supports the nutritive vessels, and by the black pigment of its posterior surface absorbs the scattered rays of light, that might otherwise confuse the image impressed on the retina. The iris regulates the quantity of light admitted through the pupil, by contracting when the rays are too strong, and expanding when the light is more feeble. The humors refract the rays so as to impress the object on the retina in the most favorable manner for distinct vision

APPENDAGES OF THE EYE.

These are the *eyebrows*, *eyelids*, *eyelashes*, *conjunctiva*, *caruncula lachrymalis*, and the *lachrymal apparatus*.

The *eyebrows*, called *supercilia*, are projecting arches of integument covered with short thick hairs, forming the upper boundary of the orbit of the eye.

The *eyelids*, called *palpebræ*, are valvular layers in front of the eye. The elliptical space between is divided into the *outer* and *inner canthus*. The inner canthus is prolonged into a triangular space toward the nose, which is called the *lacus lachrymalis*. The *lachrymal papilla* is a small angular projection at the commencement of the lacus lachrymalis on each side, each of which papilla has a small orifice at its apex, called *punctum lachrymale*, and constituting the commencement of the lachrymal canal. The thin, firm, fibro-cartilaginous bands supporting the edges of the eyelids are called the *tarsal cartilages;* in their internal surface are embedded a number of secreting tubes or follicles, called the *Meibomian glands*.

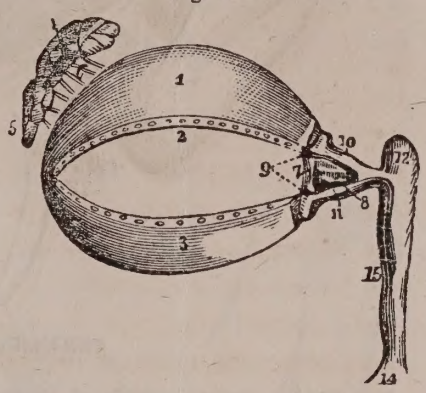
The *eyelashes*, called *cilia*, are triple rows of long thick hairs, curling upward from the upper lid, and downward from the lower; an arrangement which prevents their interlacing each other.

The *conjunctiva* covers the anterior surface of the eye, and is so reflected on the lids as to form their inner layer. The duplicates

formed between the globe and lids of the eye are called the *superior and inferior palpebral sinuses.*

The *caruncula lachrymalis* is a small reddish body occupying the lacus lachrymalis at the inner canthus. It is composed of an assemblage of mucous follicles, and secretes the whitish matter usually found at the inner angle of the eye. On the outer side of the caruncula is a fold of the conjunctiva, called *plica semilunaris;* this is the *membrana nictitans* in birds, and the rudiment of the third lid in animals.

Fig. 101.



APPENDAGES OF THE EYE.

Fig. 101 is a representation of the appendages of the eye. 1. The superior tarsal cartilage. 2. The lower border of the cartilage, on which are seen the openings of the Meibomian glands. 3. The inferior tarsal cartilage; along the upper border of this cartilage the openings of the Meibomian glands are likewise seen. 4. The lachrymal gland—its superior or orbital portion. 5. Its inferior or palpebral portion. 6. The lachrymal ducts. 7. The plica semilunaris. 8. The caruncula lachrymalis. 9. The puncta lachrymalia of the lachrymal canals. 10. The superior lachrymal canal. 11. The inferior lachrymal canal. 12. The lachrymal sac. 14. The dilatation of the nasal duct, where it opens into the inferior meatus of the nose. 15. The nasal duct.

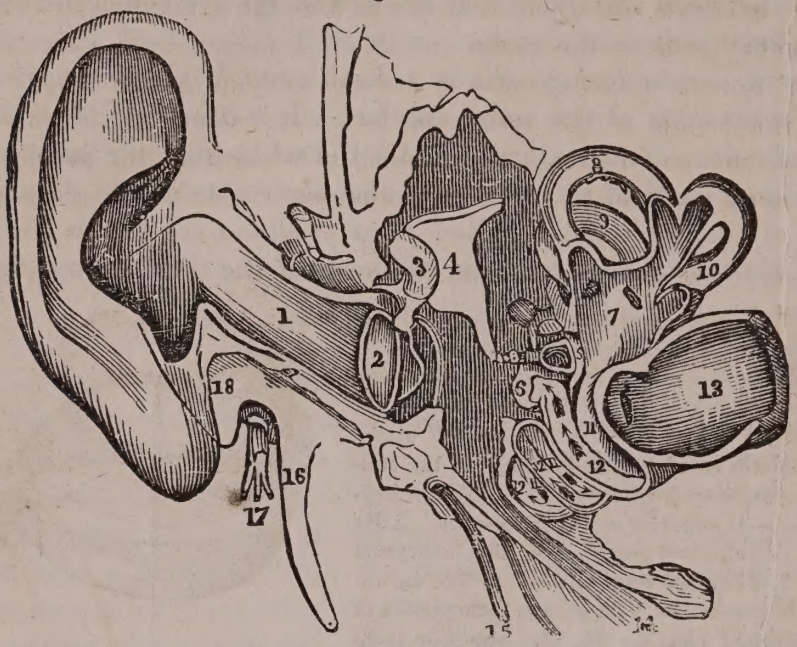
The lachrymal apparatus consists of the *lachrymal gland with its excretory duct*, the *puncta lachrymalia*, the *lachrymal canals*, the *lachrymal sac*, and the *nasal duct.*

The *lachrymal gland* is situated at the outer and upper part of the orbit. It secretes the *tears*, which are ordinarily conveyed away by small ducts which run a short distance between the conjunctiva, and then open on ts surface a little above the upper border of the tarsal cartilages. The *lachrymal canals* commence at the *puncta lachrymalia* and run inward to the lachrymal sac. The *superior* duct first ascends, then turning suddenly inward, forms an abrupt angle; the *inferior* duct, by descending, and then turning abruptly inward, forms a similar angle. The *lachrymal sac* is the upper extremity of the nasal duct. It consists of a mucous membrane covered by a fibrous expansion of the tendons of the orbicularis and tensor tarsi muscles. The *nasal duct* is a short canal, three fourths of an inch long, running downward, backward, and outward to the inferior meatus of the nose, terminating there in an enlarged orifice.

OF THE ORGAN OF HEARING.

The auditory apparatus is divided anatomically into the *external ear, tympanum*, or middle ear, and *labyrinth*, or internal ear.

Fig. 102.



STRUCTURE OF THE EAR.

Fig 102 is a representation of all parts of the ear. 1. Meatus auditorius externus. 2 Drum of the ear, or tympanum. 3, 4, 5. The bones of the ear. 7. Vestibule, the central part of the labyrinth. 8, 9, 10. The semicircular canals. 11, 12. The channels of the cochlea. 13. Auditory nerve. 14. Eustachian tube, the channel from the middle ear to the throat.

THE EXTERNAL EAR.—The *external ear* consists of the *pinna*, a funnel-shaped cartilaginous plate, which collects the vibrations of air, and the *meatus*, the tube which conveys them to the tympanum.

The *pinna* presents several folds and hollows upon its surface; a prominent rim, called *helix*, a curved ridge within it, called *antihelix;* this divides above, and encloses a space called *scaphoid fossa;* the pointed process over the opening of the ear is called *tragus;* a tubercle opposite *antitragus;* the dependent portion of the pinna is the *lobulus;* a space between the helix and antihelix is called *fossa innominata;* and the large central space to which all the channels converge is the *concha*, which opens into the *meatus.*

The *muscles* of the pinna are the *major helicis*, *minor helicis*, *tragicus*, *antitragicus*, and *transversus auriculæ;* they are merely rudimentary in the human ear, but in many animals are large and active.

The *meatus auditorius* is about an inch in length, extending inward and a little forward from the concha to the tympanum, and narrower in the middle than at either extremity. In the substance of its lining membrane are *ceruminous* glands, which secrete the ear-wax. Short

stiff hairs stretch across its interior, to prevent the ingress of insects and dust.

The pinna derives a plentiful supply of *arteries* from the anterior auricular branch of the temporal, and the posterior auricular from the carotid. Its *nerves* are branches derived from the anterior auricular of the fifth, the posterior auricular of the facial, and the auricularis magnus of the cervical plexus.

TYMPANUM.—The *middle ear* is an irregular bony cavity within the petrous portion of the temporal bone. It is bounded externally by the membrana tympani, and filled with air, which enters by the Eustachian tube.

Fig. 103 is a diagram exhibiting the principal divisions and parts of the ear. *p*. Pinna. *t*. Tympanum. *l*. Labyrinth. 1. Upper part of the helix. 2. Antihelix. 3. Tragus. 4. Antitragus. 5. Lobulus. 6. Concha. 7. Upper part of the fossa innominata. 8. The meatus. 9. Membrana tympani, divided by the section. 10. The three small bones of the ear, malleus, incus, and stapes, crossing the area of the tympanum; the foot of the stapes blocks up the fenestra ovalis upon the inner wall of the tympanum. 11. The promontory. 12. Fenestra rotunda; the dark opening above the bones leads into the mastoid cells. 13. Eustachian tube; the little canal upon this tube contains the tensor tympani muscle in its passage to the tympanum. 14. Vestibule. 15. The three semicircular canals, horizontal, perpendicular, and oblique. 16. The ampullæ upon the perpendicular and horizontal canals. 17. Cochlea. 18. A depression between the convexities of the two tubuli which communicate with the tympanum and vestibule; one is the scala tympani, terminating at 12; the other the scala vestibuli.

Fig. 103.

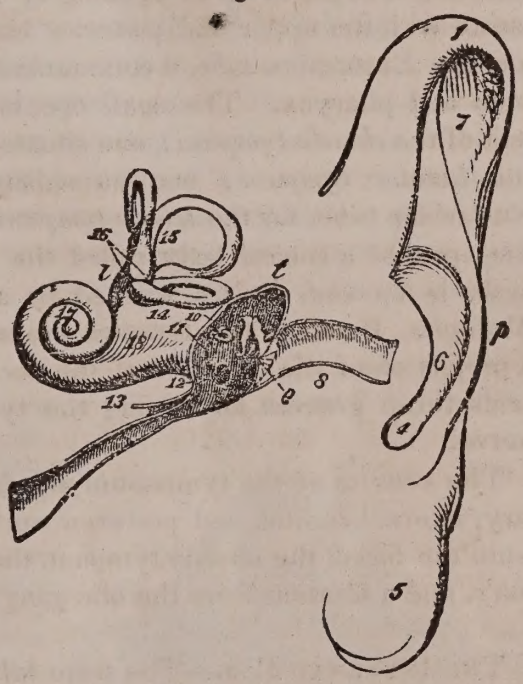


DIAGRAM OF THE EAR.

The *membrana tympani* is a thin, semi-transparent membrane, placed obliquely across the meatus, concave externally and convex toward the tympanum, and composed of an external *epidermal*, a middle *muscular*, and an internal *mucous* coat.

The proper bones of the ear (*ossicula auditûs*), viz., *malleus*, *incus*, and *stapes*, are contained in the tympanum. The *malleus* (hammer-like consists of a head, neck, and handle called *manubrium*, which is

connected with the membrana tympani by its whole length. The *incus* has an imagined resemblance to an anvil, from which circumstance its name is derived; it consists of a flattened body and two processes; its body articulates with the head of the malleus. The *stapes* is shaped like a stirrup; its head articulates with a process of the incus called *os orbiculare*. These bones are connected together and held in their places by various ligaments, and moved upon themselves by four muscles, called *tensor tympani*, *laxator tympani*, *laxator tympani minor*, and *stapedius*.

There are ten *foramina*, or openings, in the tympanum, five large and five small. The *large* openings are, *meatus auditorius*, already described; *fenestra ovalis*, communicating between the tympanum and vestibule; *fenestra rotunda*, communicating between the vestibule and cochlea; a large, irregular opening by which the *mastoid cells* communicate with the upper and posterior circumference of the tympanum; and the *Eustachian tube*, a communicating canal between the tympanum and pharynx. The *small* openings are two for the entrance and exit of the *chorda tympani;* one situated in a fissure called *Glasseri*, for the *laxator tympani;* one immediately above the opening of the Eustachian tube, for the *tensor tympani;* and one for the *stapedius*, at the apex of a conical body called the *pyramid*. Above the fenestra ovalis is a *rounded ridge* formed by a projection of the *aquæductus Fallopii*. Beneath the fenestra ovalis is the *promontory* formed by a projection of the first turn of the cochlea, the surface of which presents three grooves for lodging the tympanic branches of Jacobson's nerve.

The *arteries* of the tympanum are derived from the internal maxillary, internal carotid, and posterior auricular. Its *nerves* are branches from the facial, the chorda tympani, the tympanic branches of Jacobson's, and a filament from the otic ganglion.

The Internal Ear.—The term *labyrinth* is applied to the internal ear on account of the complexity of its communications. It consists of a bony and a membranous portion. The osseous labyrinth presents a series of cavities channeled through the substance of the petrous bone, and is situated between the cavity of the tympanum and meatus auditorius internus. It is divided into vestibule, semicircular canals, and cochlea.

The *vestibule* is a small, three-cornered cavity within the inner wall of the tympanum; its corners are called *cornua*, or *ventricles*. The semicircular canals open into it by five orifices behind, and the cochlea by a single one in front. The fenestra ovalis is on its outer wall, and

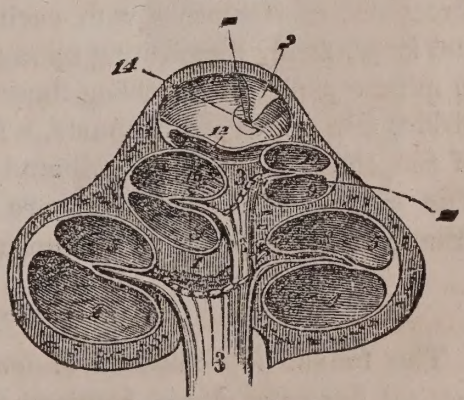
on its inner several small holes, a cluster of which is called *macula cribrosa*, for the entrance of a portion of the auditory nerve. The *scala vestibuli* is the termination of the vestibular canal of the cochlea. The *aquæductus vestibuli* is the commencement of the small canal which opens under the osseous scale upon the posterior surface of the petrous bone.

The *semicircular canals* are three bony channels, communicating with the vestibule into which they open by both extremities, each extremity being expanded like a flask, and called *ampulla*.

The *cochlea* (snail-shell) forms the anterior part of the labyrinth. It is a tapering, osseous canal, one inch and a half in length; and makes two turns and a half spirally around a central axis, called the *modiolus*, which is a porous mass of bone perforated by numerous filaments of the cochlear nerve. The canal of the cochlea is partially divided into two passages (*scalæ*) by a thin, porous plate of bone, called *lamina spiralis*, which terminates at the apex with a hook-shaped process called *hamulus*; this is covered by the *cupola*. The two scalæ communicate over the hamulus by an opening called *helicotrema*. Near the termination of the scala tympani is the small opening of the cochlear æqueduct. The internal surface of the osseous labyrinth is lined by a fibro-serous membrane, which exteriorly serves as a periosteum, and internally as a serous membrane, secreting a limpid fluid called *aqua labyrinthi*.

Fig. 104 shows the cochlea divided parallel with its axis through the centre of the modiolus. 1. Modiolus. 2. The infundibulum. 3, 3. Cochlear nerve. 4, 4. The scala tympani of the first turn of the cochlea. 5, 5. Scala vestibuli of the first turn; the septum between 4 and 5 is the lamina spiralis. 6. Loops formed by filaments of the cochlear nerve on the lamina spinalis. 9, 9. Scala tympani of the second turn of the cochlea. 10, 10. Scala vestibuli of the second turn. 11. Half turn of the scala vestibuli; the dome over it is the cupola. 14. Helicotrema; a bristle is passed through it, in front of which is the hamulus.

Fig. 104

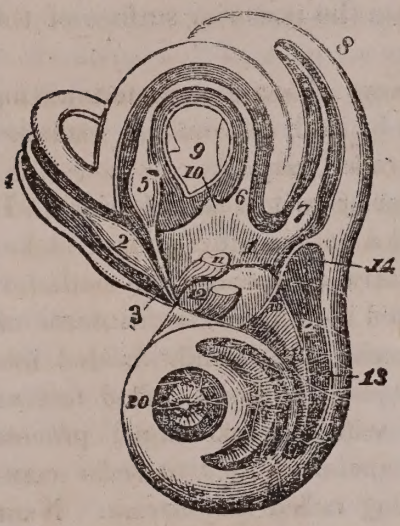


THE COCHLEA.

The *membranous labyrinth* is in form a perfect counterpart of the vestibule and semicircular canals, but smaller in size. In structure it is composed of four layers; an *external*, or *serous*, a *vascular*, a *nervous*, and an *internal*, or *serous*. Its cavity is filled with a limpid fluid, and contains two small calcareous masses, called *otocomites*; and it consists

of a small sac, *sacculus communis*, of three *semicircular membranous canals*, and a small round sac, *sacculus proprius*.

Fig. 105.



THE LABYRINTH.

Fig. 105 is the labyrinth of the left ear, laid open to exhibit its cavities and the membranous labyrinth. 1. Cavity of the vestibule. 2. Ampulla of the superior semicircular canal. 4. The superior canal, with its contained membranous canal. 5. Ampulla of the inferior canal. 6. Termination of the membranous canal of the horizontal semicircular canal in the sacculus communis. Ampulla of the middle semicircular canal. 8 The same canal with its membranous canal. 9 Common canal. 10. Membranous common canal. 11. Otoconite of the sacculus communis. 12. Sacculus proprius; its otoconite is seen through its membranous parieties. 13. First turn of the cochlea. 14. Extremity of the scala tympani, corresponding with the fenestra rotunda. 15. Lamina spiralis. 18. Half turn of the cochlea. 19. Lamina spiralis, terminating in its falciform extremity. The dark space included within the falciform curve of the extremity of the lamina spiralis is the helicotrema. 20. The infundibulum.

The *auditory nerve* divides, in the meatus auditorius internus, into a vestibular and a cochlear branch. The *vestibular* nerve divides into three branches, which are distributed to the various parts; in the substance of the sacculi and ampullæ the nervous filaments radiate in all directions, anastomosing with each other, and forming interlacements and loops, finally terminating upon the inner surface of the membrane in minute papillæ, resembling those of the retina. The *auditory nerve* divides into numerous filaments, which enter the foramina in the base of the cochlea, and are distributed to the tissue of the lamina spiralis. The *arteries* of the labyrinth are derived mainly from the auditory branch of the superior cerebellar artery.

THE ORGAN OF TASTE.

The tongue is composed of *longitudinal*, *transverse*, *oblique*, and *vertical* muscular fibres, between which is a quantity of adipose substance; it is connected posteriorly with the os hyoides by a muscular attachment; and to the epiglottis by mucous membrane, which forms the three folds called *fræna epiglottidis*; and on each side with the lower jaw by the same membrane, which forms a fold in front beneath its under surface, called *frænum linguæ*.

The surface of the tongue is covered by a dense layer, which sup-

ports its *papillæ*, of which there are four kinds. 1. *Papillæ circumvallatæ*, or *lenticular*, are of large size, and fifteen or twenty in number, situated near the root, and arranged in two rows, which meet at the middle line, like the branches of the letter A. At their point of meeting is a deep mucous follicle, called *foramen cæcum*. 2 and 3. *Papillæ conicæ* and *papillæ filiformes*, conical and filiform in shape, cover the surface of the tongue in front of the circumvallatæ; their extremities are pierced by a minute aperture, hence they may be regarded as follicles rather than sentient points, the true sentient organs being extremely minute papillæ occupying their surface as well as that of the other papillæ. 4. *Papillæ fungiformes*, or *capitatæ*, are larger than the former, have rounded heads, and are irregularly dispersed over the dorsum of the tongue; a number of these are seen at the tip.

Behind the papillæ, at the root of the tongue, are a number of *mucous glands*.

Fig. 106.

THE TONGUE.

The tongue and its papillæ are seen in Fig. 106. 1. The raphe, which sometimes bifurcates in the dorsum, as in the figure. 2, 2. Lobes of the tongue; the rounded eminences on this part of the organ and near its tip are the fungiform papillæ; the smaller papillæ, among which the former are dispersed, are the conical and filiform papillæ. 3. Tip of the tongue. 4, 4. Its sides, on which the papillæ are arranged in fringed and lamellated forms. 5, 5. The A-shaped row of papillæ circumvallatæ. 6. Foramen cæcum. 7. Mucous glands at the root of the tongue. 8. Epiglottis. 9, 9. Fræna epiglottidis. 10, 10. Greater cornua of the hyoid bone.

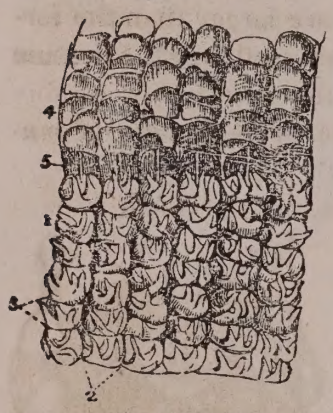
The tongue is abundantly supplied with blood by the lingual *arteries*. Its *nerves* are of large size, and three in number. The nerve of common sensation and taste is the *gustatory* branch of the fifth pair, which is distributed to the papillæ; the *glosso-pharyngeal* supplies the mucous membrane, follicles, and glands, and is a nerve of sensation and motion; the *hypo-glossal* is the principal motor nerve, distributed to the muscles. The chorda tympani, sent from the facial nerve to the lingualis muscle, must be added to the motor influence.

THE ORGAN OF TOUCH.

The *skin*, which is continuous with the mucous membrane of the internal cavities, is composed of two layers—*derma* and *epiderma*.

The *derma*, or *cutis* (true skin), is chiefly composed of elastic cellulo-fibrous tissue, abundantly supplied with blood-vessels, lymphatics and nerves. It is divided into a deep stratum, called *corium*, the structure of which is dense, white, and coarse, forming a network of channels, by which the branches of vessels and nerves pass to the superficial layer; and a superficial stratum, called *papillary*, which is raised in the form of papillæ, or conical prominences, each being composed of a convoluted capillary vessel and a convoluted nervous loop.

Fig. 107



INTEGUMENT OF THE HAND.

Fig. 107 shows the anatomy of a portion of the skin taken from the palm of the hand. 1. Papillary layer, marked by longitudinal furrows (2), which arrange the papillæ into ridges. 3. Transverse furrows, which divide the ridges into small quadrangular clumps. 4. The rete mucosum raised from the papillary layer and turned back. 5, 5. Perspiratory ducts drawn out straight by the separation of the rete mucosum from the papillary layer.

The *epiderma*, or *cuticle* (scarf-skin), envelops and protects the derma, of which it is a product. Its external surface is hard and horny, its internal soft and cellular; this surface or layer is called the *rete mucosum*. The whole epidermal structure is laminated, the plates or scales increasing in density from the inner to the outer surface.

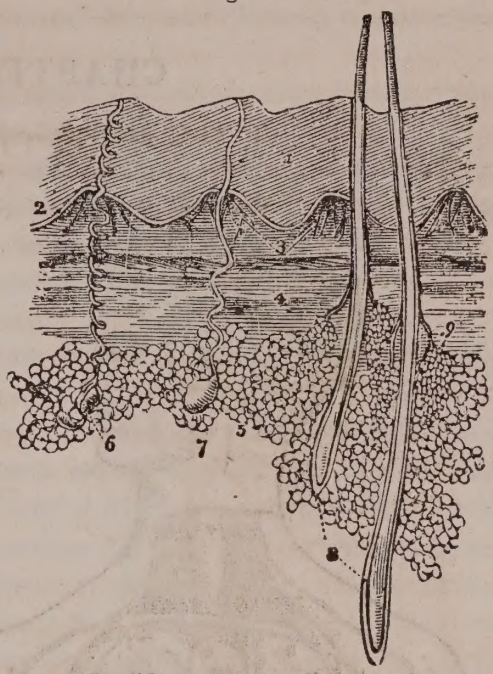
The *pores* of the epiderma are the openings of the perspiratory ducts, hair follicles, and sebiparous glands. The *arteries* of the derma divide into innumerable intermediate vessels, forming a capillary plexus in the superficial strata and papillary layer. No *lymphatics* have been discovered in the papillæ, but they are supposed to be interwoven with the capillary and mucous plexuses in the superficial strata of the derma.

APPENDAGES OF THE SKIN.—These are the nails, hair, sebiparous glands, and perspiratory glands and ducts.

The *nails* are a part of the epiderma, and identical in structure; they are implanted in a fold of the derma, called *matrix*, which acts the part of a follicle; at the bottom of the groove of the follicle are a number of filiform papillæ, which produce the margin of the root, and, by the successive formation of new cells, push the nail onward in its growth. The concave surface of the nail is in contact with the derma, and the latter is covered by papillæ, which detain the nail in place, and increase its thickness by the addition of newly-formed cells on its under surface.

In Fig. 108 are seen—1. The epiderma. 2. Its deep layer, the rete mucosum. 3. Two of the quadrangular papillary clumps composed of minute conical papillæ, such as are seen in the palm of the hand or sole of the foot. 4. Deep layer of the derma, the corium. 5. Adipose cells. 6. A sudoriparous gland with its spiral duct, as are seen in the palm of the hand and sole of the foot. 7. Another sudoriparous gland with a straighter duct, such as is seen in the scalp. 8. Two hairs from the scalp, inclosed in their follicles; their relative depth in the skin is preserved. 9. A par of sebiparous glands, opening by short ducts into the follicle of the hair.

Fig. 108.



ANATOMY OF THE SKIN

The *hairs* are horny appendages, produced by the involution of the epiderma, constituting the *follicle*, and subsequent evolution of the same structure, constituting the *shaft* of the hair. Hairs are variable in length and thickness in different parts of the body. Their free extremity is generally pointed, and sometimes split into filaments; the central extremity, called the *bulb*, is implanted deeply in the integument, extending through the epiderma into the cellular tissue, where it is surrounded by adipose cells. The hair is formed from its follicle by a process identical with the formation of the epiderma by the papillary layer of the derma.

The *color* of the hair, and also of the epiderma, is owing to the coloration of the primitive granules, of which the cells are composed.

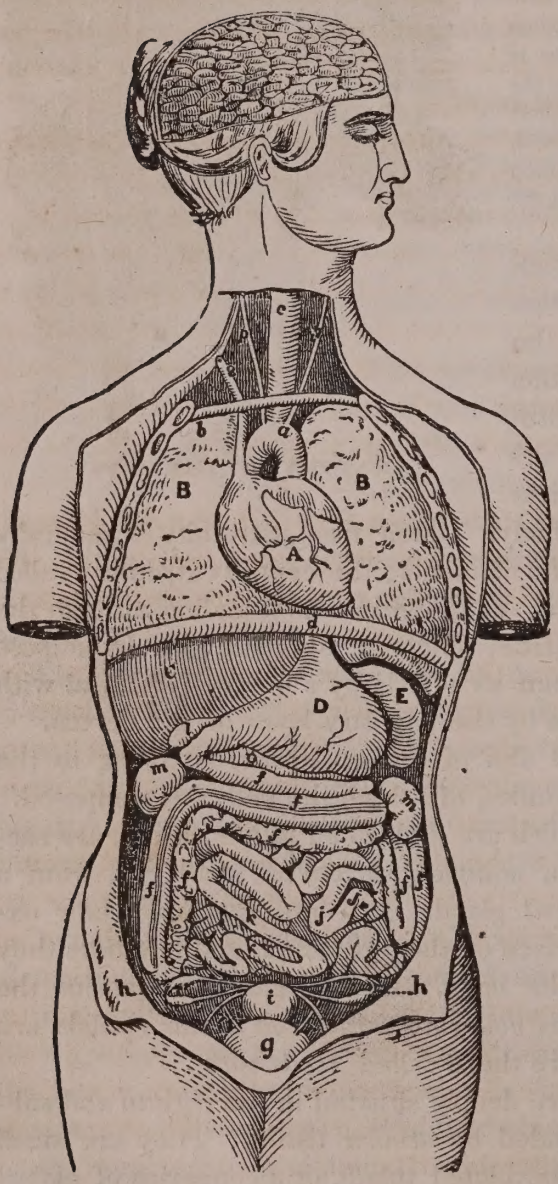
The *sebiparous glands*, which are embedded in the derma, are sacculated glandular bodies, of a complex variety of structure, from a pouch-like follicle to a lobulated gland. In some situations their excretory ducts open on the surface of the epiderma, and in others they terminate in the follicles of the hairs. In the meatus auditorius the sebiparous glands, called *ceruminous*, are large, and in the eyelids are the largest in the body, and are there called *Meibomian*.

The *sudoriparous glands* are deeply situated in the corium and subcutaneous tissue, and surrounded by areolar tissue. They are small oblong bodies, composed of convoluted tubuli, or a congeries of globular sacs, opening in a common efferent duct, which ascends through the derma and epiderma, and terminates on the surface by an oblique funne-shaped aperture or pore.

CHAPTER X.

OF THE VISCERA—SPLANCHNOLOGY.

Fig. 109.



VITAL SYSTEM

THOSE organs of the body called viscera, occupy three great internal cavities, the cranio-spinal, thorax, and abdomen. The first is occupied by the brain and spinal marrow already described; the thoracic cavity, or chest, contains the heart, lungs, and thymus gland; the abdominal cavity proper contains the stomach and intestines, liver, pancreas, spleen, kidneys, and supra-renal capsules; and its lower portion called the pelvis, contains the bladder and internal organs of generation.

The relative situation of the principal viscera may be seen in Fig. 109.

A. Heart. B, B. Lungs. C. Liver. D. Stomach. E. Spleen. *m*, *m*. Kidneys. *g*. Bladder. *d* is the diaphragm which forms the partition between the thorax and abdomen. Under the latter is the cardiac orifice of the stomach, and at the right extremity, or pit of the stomach is the pyloric orifice.

THORACIC VISCERA.

THE HEART.—The heart, which is the central organ of circulation

is a strong, muscular organ, enclosed in a proper membrane, called *pericardium*, and situated between two layers of pleura, which constitute the mediastinum.

The *pericardium* (heart-case) consists of an external fibrous and an internal serous layer.

The *heart* is placed oblique between the lungs, with its apex pointing to the space between the fifth and sixth ribs, two or three inches from the sternum on the left side. It consists of two auricles, right and left, and two ventricles, also right and left. The right is the venous, and the left the arterial side of the heart.

The *right auricle* is larger than the left; its interior, called *sinus*, presents five openings and two valves.

The *openings* are: the *superior cava*, which pours the venous blood from the upper part of the body into its upper part; the *inferior cava*, which returns the blood of the lower half of the body into its lower part; the *coronary vein*, which returns the blood from the substance of the heart; the *foramina Thebesii*, small pore-like openings through which the venous blood oozes from the muscular structure into the auricles; and *auriculo-ventricular*, the communication between the auricle and ventricle.

The *valves* are: the *Eustachian*, which belongs to the fœtal circulation, and serves to direct the placental blood from the inferior cava through the foramen ovale into the left auricle; and the *coronary*, a semilunar fold across the mouth of the coronary vein.

There are two *relicts of the fœtal structure*, the *annulus ovalis*, situated on the partition (*septum arcularium*) between the two auricles, occupying the place of the foramen ovale of the fœtus; and the *fossa ovalis*, an oval depression corresponding with the fœtal foramen ovale, and closed at birth by a thin valvular layer.

The *proper structure* of the auricle is divided into an intervening portion between the openings of the cavas, called *tuberculum Loweri*, and numerous small parallel columns of muscular fibres situated in the *appendix auricula*.

The *right ventricle* receives the venous blood from the right auricle, and transmits it to the lungs. Its anterior side is convex the greater proportion of the front of the heart; its posterior and lower side is flat, resting upon the diaphragm. It contains two openings, two sets of valves, and a muscular and tendinous structure.

The openings are, the *auricular ventricular*, the communication between the right auricle and ventricle; and the *opening* of the *pulmonary artery*, which is situated close to the septum between the ventricles.

The *valves* are, the *tricuspid*, three triangular folds of the lining

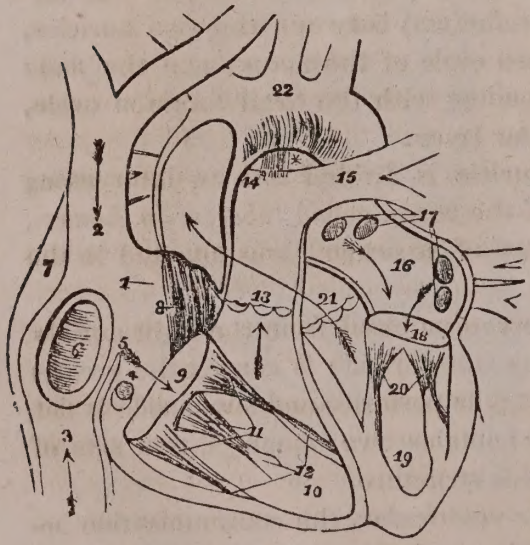
membrane, strengthened by a layer of fibrous tissue, connected by their base around the auriculo-ventricular opening, and prevent the regurgitation of blood into the auricle during the contraction of the ventricle; and the *semilunar*, three in number, situated around the commencement of the pulmonary artery.

The *muscular and tendinous* apparatus belongs to the tricuspid valves. It consists of thick muscular columns (*columnæ carneæ*), and their tendons (*chordæ tendineæ*), which stand out from the walls of the ventricles, and serve as muscles to the valves.

The *left auricle* receives the arterial blood from the lungs; it is smaller and thicker than the right. It has *four openings for the pulmonary veins*, two from the right and two from the left lung; and an *auriculo-ventricular opening*, which communicates between it and the left ventricle. Its *musculi pectinati* are fewer in number than in the right auricle, and are situated only in the appendix auriculæ.

The *left ventricle*, which receives the blood from the left auricle and sends it through the aorta, forms the apex of the heart; its figure is conical externally and internally. Its openings are, the *auriculo-ventricular*, between the auricle and ventricle, and the *aortic*. Its valves are the *mitral*, attached around the auriculo-ventricular communication to prevent the retrograde passage of the blood, and, like the tricuspid, are furnished with a muscular apparatus; and the *semilunar* placed around the commencement of the aorta.

Fig. 110.



ANATOMY OF THE HEART.

Fig. 110 is a general view of the internal structure of the heart. 1. Right auricle. 2. Entrance of the superior cava. 3. Entrance of the inferior cava. 4. Opening of the coronary vein, half closed by the valve. 5. Eustachian valve. 6. Fossa ovalis, surrounded by the annulus ovalis. 7. Tuberculum Loweri. 8. Musculi pectinati in the appendix auriculæ. 9. Auriculo-ventricular opening. 10. Cavity of right ventricle. 11. Tricuspid valve, attached by the chordæ tendinæ to the carneæ columnæ (12). 13. The pulmonary artery, guarded at its commencement by three semilunar valves. 14. Right pulmonary artery, passing beneath the arch and behind the ascending aorta. 15. Left pulmonary artery, crossing in front of the descending aorta. * Remains of the ductus anteriosus, acting as a ligament between the pulmonary artery and arch of the aorta. The arrows mark the course of the venous blood through the right side of the heart. 16. Left auricle. 17. Openings of the fourth pulmonary

veins. 18. Auricule-ventricular opening. 19. Left ventricle. 20. Mitral valve, attached by its chordæ tendinæ to two large columnæ carneæ, which project from the walls of the ventricle. 21. Commencement and course of the ascending aorta behind the pulmonary artery, marked by an arrow; the entrance of the vessels is guarded by three semilunar valves. 22. Arch of the aorta. The comparative thickness of the two ventricles is shown in the diagram. The course of the blood through the left side of the heart is denoted by arrows.

The *general structure* of the heart is an arrangement of strong muscular fibres, disposed in several layers, so as to form fibrous rings and bands, which afford it the greatest possible amount of strength for its bulk. Its *arteries* are the *anterior* and *posterior coronary;* its *veins* empty into the right auricle by the common coronary; its *lymphatics* terminate in the glands about its root; and its *nerves* are derived from the cardiac plexuses, which are formed by communicating filaments from the ganglionic and pneumogastric.

Fig. 111.

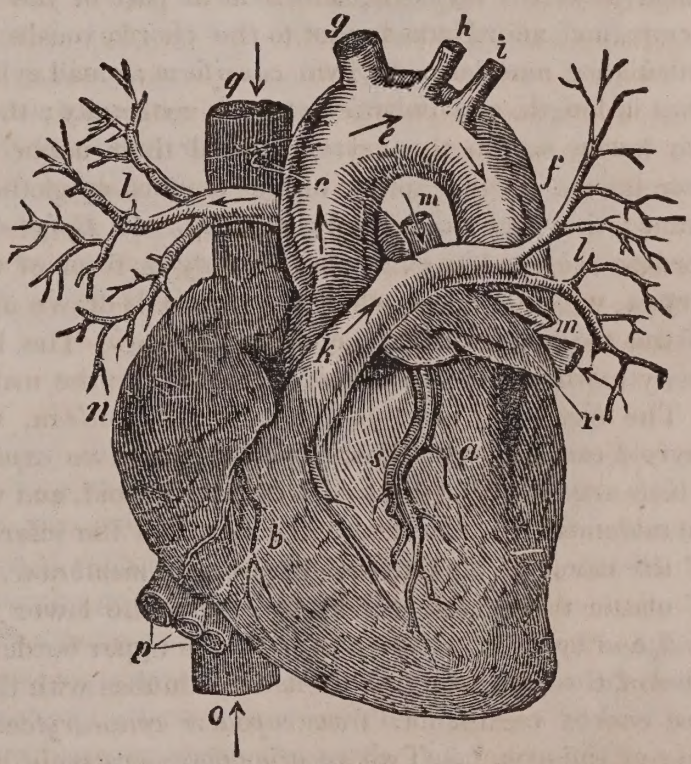


Fig. 111 is an external view of the heart. *a.* Left ventricle. *b.* Right ventricle. *c, e, f.* Aorta arising from the left ventricle. *g.* Arteria innominata. *h.* Left subclavian artery. *i.* Left carotid. *k.* Pulmonary artery. *l, l.* Its right and left branches. *m, m.* Veins of the lungs. *n.* Right auricle. *o.* Ascending cava. *q.* Descending cava. *r.* Left auricle. *s.* Left coronary artery. *P.* Portal veins, which return the blood from the liver and bowels.

THE HEART.

ORGANS OF VOICE AND RESPIRATION.

The cartilaginous and muscular structure at the upper part of the windpipe, called the larynx, constitutes the apparatus of voice; the lungs and trachea are the organs of respiration.

OF THE LARYNX.

The larynx is a short tube, of an hour-glass form, situated at the

upper and front part of the neck, composed of *cartilages*, *ligaments muscles*, *vessels*, *nerves*, and *mucous membrane*.

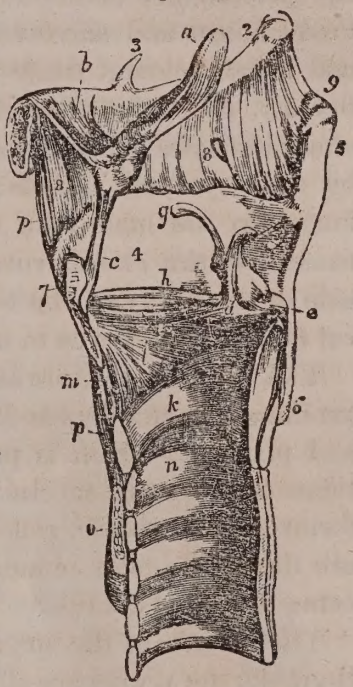
The cartilages are: 1. *Thyroid* (shield-like), which consists of two lateral portions *(alæ)* meeting at an angle in front, and forming the projecting part of the throat, called *pomum Adami* (Adam's apple). Each ala forms a rounded border posteriorly, which terminates above in a *superior cornu*, and below in an *inferior cornu*. 2. *Cricoid* (like a ring), a circular ring, narrow in front and broad behind, where it has two rounded surfaces, which articulate with the arytenoid cartilages. The œsophagus is attached to a vertical ridge on its posterior surface. 3. Two *arytenoid* (pitcher-like); triangular in form, and broad and thick below, where they articulate with the upper border of the cricoid; above they are pointed and prolonged by two small pyriform cartilages, called *cornicula laryngis*, which form part of the lateral wall of the larynx, and afford attachment to the chorda vocalis and several of the articulating muscles. 4. Two *cuneiform;* small cylinders, about seven lines in length, and enlarged at each extremity; they are attached by the lower end to the arytenoid, and their upper extremity forms a prominence on the border of the aryteno-epiglottidean fold of membrane; they are occasionally wanting. 5. *Epiglottis;* shaped like a cordate leaf, and situated immediately in front of the opening of the larynx, which it closes when the larynx is drawn up beneath the base of the tongue, as in the act of swallowing. The laryngeal cartilages ossify more or less in old age, particularly in the male.

The *ligaments* are: 1. Three *thyro-hyoidean*, which connect the thyroid cartilage with the os hyoides. 2. Two *capsular crico-thyroid*, which articulate the thyroid with the cricoid, and with their synovial membranes from the articulation between the inferior cornu and sides of the cricoid. 3. The *crico-thyroidean membrane*, a fan-shaped layer of elastic tissue, attached by its apex to the lower border of the thyroid, and by its expanded margin to the upper border of the cricoid and base of the arytenoid; above it is continuous with the lower margin of the chorda vocalis. 4. Two *capsular crico-arytenoid*, which connect those cartilages. 5. Two *superior thyro-arytenoid*, thin bands between the receding angle of the thyroid and the anterior inner border of each arytenoid; the lower border constituting the upper boundary of the ventricle of the larynx. 6. Two *inferior thyro-arytenoid*, the *chordæ vocales*, which are thicker than the superior, and, like them, composed of elastic tissue. Each ligament, or vocal chord, is attached in front to the receding angle of the thyroid, and behind to the anterior angle of the base of the arytenoid. The inferior border of the chorda vocalis is continuous with the lateral expansion of the crico-thyroid ligament

The superior border forms the lower boundary of the ventricle of the larynx. The space between the two chordæ vocales is the *glottis*, or *rima glottidis*. 7. Three *glosso-epiglottic*, folds of mucous membrane connecting the anterior surface of the epiglottis with the root of the tongue. 8. The *hyo-epiglottic*, an elastic band connecting the anterior aspect of the epiglottis with the hyoid bone. 9. The *thyro-epiglottic*, a slender elastic slip embracing the apex of the epiglottis, and inserted into the thyroid above the chordæ vocales.

Fig. 112 is a vertical section of the larynx, showing its ligaments. 1. Body of the os hyoides. 2. Its great cornu. 3. Its lesser cornu. 4. The ala of the thyroid. 5. Its superior cornu. 6. Its inferior cornu. 7. Pomum Adami. 8, 8 Thyro-hyoidean membrane; the opening near the posterior numeral transmits the superior laryngeal nerve and artery. 9. Thyro-hyoidean ligament. *a*. Epiglottis. *b*. Hypo-epiglottic ligament. *c*. Thyro-epiglottic. *d*. Arytenoid cartilage. *e*. Outer angle of its base. *f*. Corniculum laryngis. *g*. Cuneiform cartilage. *h*. Superior thyro-arytenoid ligament. *i*. Chorda vocalis, or inferior thyro-arytenoid; the elliptical space between the two thyro-arytenoid is the laryngeal ventricle. *k*. Cricoid cartilage. *l*. Lateral portion of the crico-thyroidean membrane. *m*. Its central portion. *n*. Upper ring of the trachea, which is received within the ring of the cricoid cartilage. *o*. Section of the isthmus of the thyroid gland. *p, p*. The levator of the glandulæ thyroideæ

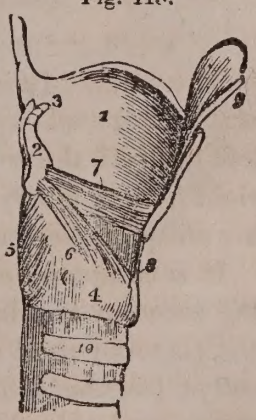
Fig. 112.



LIGAMENTS OF THE LARYNX.

The *muscles* are eight in number: five larger ones of the chordæ vocales and glottis, and three smaller of the epiglottis. The origin, insertion, and use of each is expressed by its name. They are the *crico-thyroid*, *posterior* and *lateral crico-arytenoid*, *thyro-arytenoid*, *arytenoid*, *thyro-epiglottic*, and *superior* and *inferior aryteno-epiglottic*. The posterior crico-arytenoid opens the glottis; the arytenoid approximates the arytenoid cartilages posteriorly, and the crico-arytenoideus lateralis and thyro-arytenoidei anteriorly; the

Fig. 113.



THE LARYNX LATERALLY.

Fig. 113 is a side view of the larynx, one ala of the thyroid cartilage being removed. 1. Remaining ala. 2. One of the arytenoid cartilages. 3. One of the cornicula laryngis. 4. Cricoid cartilage. 5. Posterior crico-arytenoid muscle. 6. Crico-arytenoideus lateralis. 7. Thyro-arytenoideus. 8. Crico-thyroidean membrane. 9. One half of the epiglottis. 10. Upper part of the trachea.

latter also close the glottis mesially. The crico-thyroidei are tensors of the vocal chords, and with the thyro-arytenoidei, regulate their position and vibrating length. The remaining muscles assist in regulating the tension of the vocal chords by varying the position of their cartilages.

The *aperture* of the larynx is a triangular opening, broad in front and narrow behind; bounded in front by the epiglottis, behind by the arytenoid muscle, and on the sides by folds of mucous membrane. The cavity is divided into two parts by an oblong constriction produced by the prominence of the vocal chords; the part above the constriction is broad above and narrow below, and the part beneath is narrow above and broad below; while the space included by the constriction is a narrow, triangular fissure, the *glottis*, bounded on the sides by the chordæ vocales and inner surface of the arytenoid cartilages, and behind by the arytenoid muscle; it is nearly an inch in length, somewhat longer in the male than female. Immediately above the prominence caused by the chorda vocalis, and extending nearly its length on each side of the cavity of the larynx is the *ventricle of the larynx*, an elliptical fossa which serves to isolate the chord.

The *mucous membrane* lines the entire cavity of the larynx, its prominences and depressions, and is continuous with that of the mouth and pharynx, which is prolonged through the trachea and bronchial tubes into the lungs. In the ventricles of the larynx the membrane forms a cæcal pouch, called *sacculus laryngis*, on the surface of which are the openings of numerous follicular glands, whose secretion lubricates the vocal chords.

The *arteries* of the larynx are derived from the superior and inferior thyroid; the *nerves* are the superior laryngeal and recurrent laryngeal branches of the pneumogastric.

OF THE TRACHEA.

The *trachea* (windpipe) commences opposite the fifth cervical vertebra, and extends to the third dorsal, where it divides into the right and left bronchi, the *right bronchus* passing off to the upper part of the right lung at nearly right angles, and the *left*, which is smaller, descending obliquely beneath the arch of the aorta of the left lung.

It is composed of fifteen to twenty *cartilaginous rings*, which form the anterior two thirds of its cylinder; *fibrous membrane*, which forms the posterior third of the tube; *mucous membrane*, which lines it internally; *longitudinal elastic fibres*, situated beneath the mucous membrane; and *muscular fibres*, which form a thin, transverse layer between the extremities of the cartilages; their posterior surface is covered by

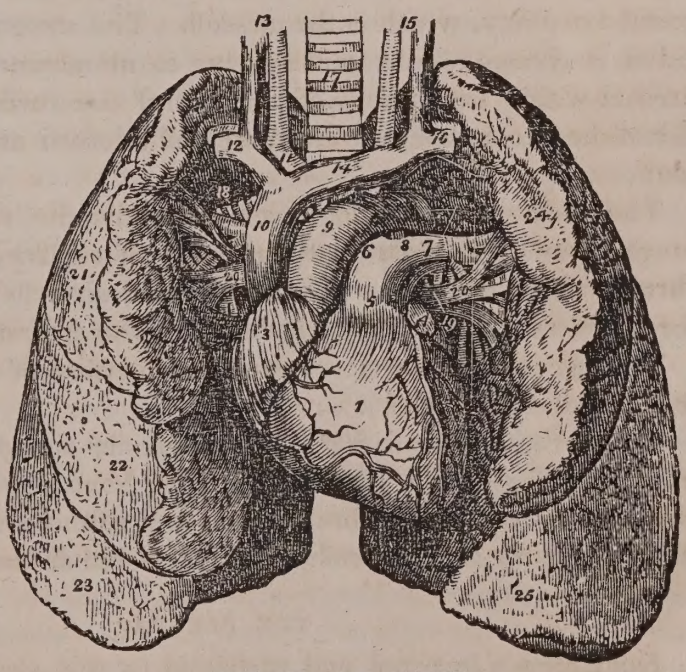
cellular tissue, in which are lodged the tracheal glands, which secrete the lubricating mucus.

THE THYROID GLAND.

In structure this body is composed of a dense aggregation of minute independent membranous cavities, enclosed by a plexus of capillary vessels, and connected by cellular tissue The cavities are filled with cyto-blasts and cells. It is situated upon the trachea, above the sternum, being divided into two lobes, one of which is placed on each side; the connection between the lobes is called the *isthmus*. This gland is larger in children and females than in adults and males. It is profusely supplied with *blood* by the superior and inferior thyroid arteries; its *nerves* are derived from the superior laryngeal and sympathetic. The function of this organ is entirely unknown. Its enlargement constitutes the disease called goitre, or bronchocele.

OF THE LUNGS.

Fig. 114.



HEART AND LUNGS

Fig. 114 represents the anterior aspect of the anatomy of the heart and lungs. 1. Right ventricle; the vessels to the left of the number are the middle coronary artery and veins. 2. Left ventricle. 3. Right auricle. 4. Left auricle. 5. Pulmonary artery. 6. Right pulmonary artery. 7. Left pulmonary artery. 8. Remains of the ductus arteriosus. 9. Aortic arch. 10. Superior cava. 11. Arteria innominata; in front of it is the right vena innominata. 12. Right subclavian vein; behind it is its corresponding artery. 13. Right common carotid artery and vein. 14. Left vena innominata. 15. Left carotid artery and vein. 16. Left subclavian artery and vein. 17. Trachea. 18. Right bronchus. 19. Left bronchus. 20, 20. Pulmonary veins; 18, 20, from the root of the right lung; and 7, 19, 20, the root of the left. 21. Upper lobe of right lung. 22. Its middle lobe. 23. Its inferior lobe. 24. Superior lobe of left lung. 25. Its lower lobe.

The lungs are two conical organs occupying the cavity of the chest

on each side of the heart, from which they are separated by a membranous partition, the mediastinum. They are tapering above, where they extend beyond the level of the first rib, and broad and concave below, where they rest on the convex surface of the diaphragm. Their color is pinkish-gray, variously mottled and marked with black. Each lung is divided into two lobes by a long, deep fissure, and in the right lung the upper lobe is subdivided by a second fissure.

The *root* of each lung, which retains it in position, comprises the pulmonary artery and veins, and bronchial tubes, with the bronchial vessels and pulmonary plexuses of nerves.

The *structure* of the lungs is composed of ramifications of the bronchial tubes, terminating in intercellular passages and air-cells, and the ramifications of the pulmonary artery and vein, bronchial arteries and veins, lymphatics and nerves, the whole held together by cellular tissue, and called the *parenchyma*.

The *bronchial tubes*, on entering the lungs, divide into two branches, and each of these divide and subdivide until lost in intercellular passages, and these, after several bifurcations, ultimately terminate by a cæcal extremity, which is the air-cell. The structure of the bronchial tubes is changed from cartilaginous to membranous after they have arrived within one eighth of an inch of the surface of the lung, and diminished to a diameter between one thirtieth and one fiftieth of an inch.

The *pulmonary artery*, which transmits the venous blood to the lungs, terminates in a minute network of capillary vessels, distributed through the walls of the air-passages and air-cells; these converge to form the pulmonary veins, which return the arterial blood to the heart.

The *lymphatics* of the substance and surface of the lungs terminate in the bronchial glands.

The *nerves*, derived from the ganglionic and pneumogastric, form *anterior* and *posterior plexuses* upon the front and back of the root of the lungs, from which branches follow the course of the bronchial tubes to supply the intercellular passages and air-cells.

THE PLEURA.

Each lung is invested and sustained by the *pleura*, a serous membrane, which invests it as far as the root, and is then reflected upon the sides of the chest and across the diaphragm. The part enclosing the lung is called *pleura pulmonalis*, and that in contact with the parietes of the chest, the *pleura costalis*; the two reflected portions in the middle of the chest form a septum, called *mediastinum*, which divides the thorax into two pulmonary cavities; this portion is distinguished

into *anterior*, *posterior*, and *middle* portions, the latter containing the heart and its pericardium, the ascending aorta, the superior vena cava, the bifurcation of the trachea, the pulmonary arteries and veins, and the phrenic nerves.

THE ABDOMINAL VISCERA.

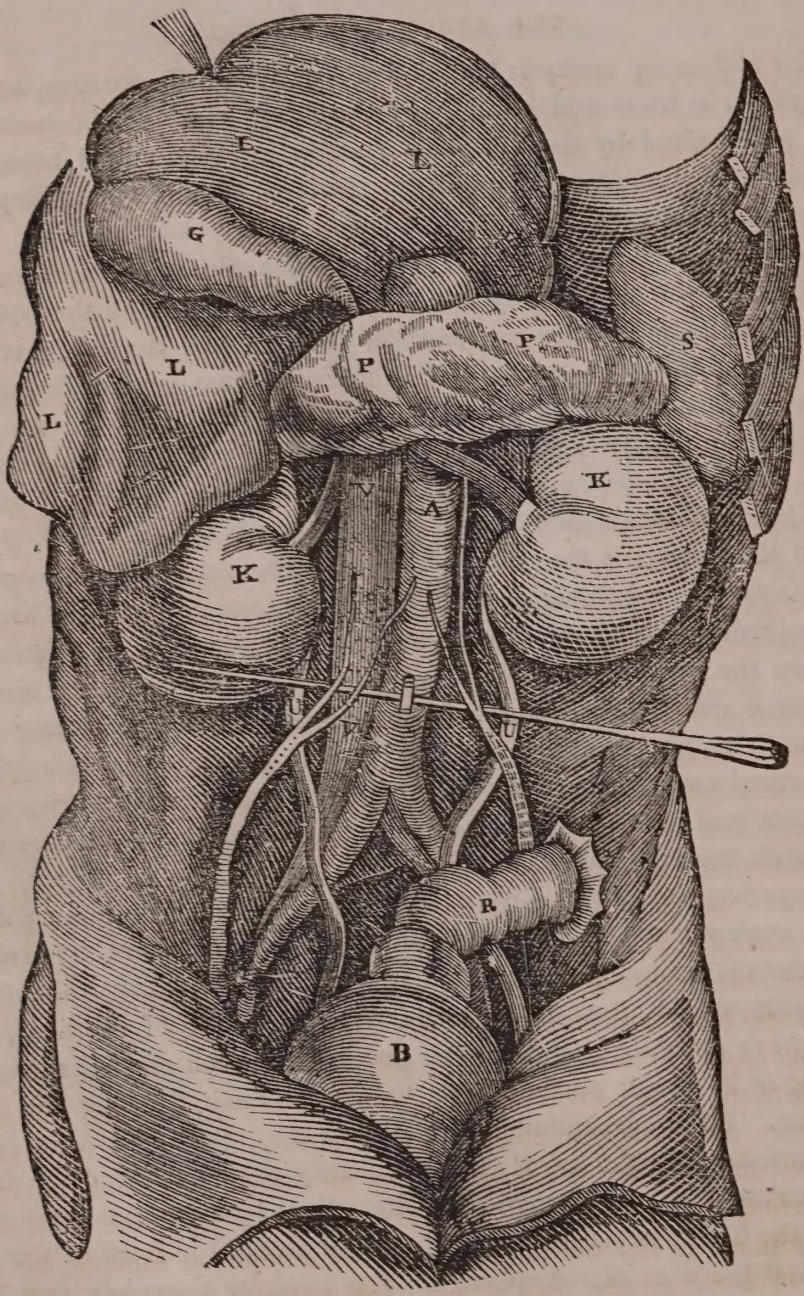
The abdominal cavity is bounded above by the diaphragm, below by the pelvis, in front and laterally by the lower ribs and abdominal muscles, and behind by the vertebral column and abdominal muscles; it contains the alimentary canal, liver, pancreas, spleen, and kidneys, with the supra-renal capsules.

ABDOMINAL REGIONS.—For convenience the abdominal cavity is divided into *nine* regions, by two transverse lines around the body, one parallel with the inferior convexity of the ribs, and the other with the highest points of the crests of the ilia; and two perpendicular lines, one at each side, drawn from the cartilage of the eighth rib to the middle of Poupart's ligament; the central region of the upper zone is called the *epigastric*, and its lateral divisions *right* and *left hypochondriac;* the middle region of the middle zone is the *umbilical*, the two lateral the *lumbar;* the middle of the lower zone is the *hypogastric*, and the two lateral the *iliac*. In the upper zone is found the liver, extending from the right to the left side; the stomach and spleen on the left, and the pancreas and duodenum behind; in the middle zone the transverse colon, upper part of the ascending and descending colon, omentum, small intestine, mesentery, and, behind, the kidneys and supra-renal capsules. In the lower zone is the inferior portion of the omentum and small intestine, the cæcum, ascending and descending colon with the sigmoid flexure, and the ureters.

The *peritoneum* is the serous membrane of the abdominal cavity; it invests each viscus separately, and is then reflected upon the surrounding parieties, enclosing the whole in a sac. The diaphragm is lined by two layers, which, descending to the upper surface of the liver, form its *coronary* and *lateral ligaments;* and, after surrounding the liver and meeting at its under surface, pass to the stomach, forming the *lesser omentum*. After surrounding the stomach they descend in front of the intestines, forming the *great omentum;* they then surround the transverse colon, and pass backward to the spine, forming the *meso-colon*, where the layers separate. The *posterior* ascends in front of the pancreas and aorta to the diaphragm; the *anterior* descends, and, after investing all the small intestines, returns to the spine, thus forming the *mesentery*. Descending into the pelvis, it forms the *meso-rectum*, and a pouch called the *recto-vesical fold*, between the rectum and bladder

it then ascends upon the neck of the bladder, forming its *false liga-ments*, and returns upon the front walls of the abdomen to the dia-phragm.

Fig. 115.



ABDOMINAL CAVITY

Fig. 115 exhibits the abdominal cavity, with the intestines mostly removed. L. Liver turned up to show its under surface. G. Gall-bladder. P. Pancreas. K. Kidneys. S. Spleen. A. Descending aorta. V V. Ascending vena cava. R. Rectum. B. Bladder

In the female it is reflected on the posterior surface of the vagina and both surfaces of the uterus, forming on each side the *broad ligament* of the latter viscus.

The *great omentum* consists of four layers, the two which descend from the stomach again returning upon themselves to the transverse colon; a quantity of adipose matter is deposited around the vessels which ramify through it. Its function is to protect the intestines from cold and friction, and facilitate their movements upon each other in their peristaltic action.

The *mesentery* retains the small intestines in their places, and gives passage to the mesenteric arteries, veins, nerves, and lymphatics.

There are small, irregular pouches of the peritoneal membrane, filled with fat, and situated like fringes upon the large intestines, which are called *appendices epploicæ*. The *gastro-phrenic ligament* is a duplicature extending from the diaphragm to the lesser curve of the stomach and extremity of the œsophagus; the *gastro-splenic omentum* is a duplicature connecting the stomach and spleen.

In *structure* a serous membrane consists of an external cellular fibrous layer, which is vascular and adherent to surrounding structures, and an internal dense and smooth layer, deficient of vessels. In general character serous membranes resemble a shut sac, and secrete a fluid resembling the serum or watery part of the blood.

THE ALIMENTARY CANAL.

The *alimentary canal* is a continuous tube from the mouth to the anus, musculo-membranous in structure, and distributed into various portions, called mouth, pharynx, œsophagus, stomach, and intestines; the intestines are subdivided into the small, which are distinguished into duodenum, jejunum, and ileum; and large intestines, distinguished into cæcum, colon, and rectum.

The Mouth.—The mouth is an irregular cavity, containing the organs of taste and instruments of mastication.

The *lips* are two fleshy folds attached to the surface of the jaws, and formed externally of common integument, internally of mucous membrane, with layers of muscles and numerous small glands between.

The *cheeks* (buccæ) form the sides of the face, and are constituted similarly to the lips; their glands are called *buccal*.

The *hard palate* is a dense structure of mucous membrane, fibrous tissue, glands, vessels, and nerves, firmly connected to the palate processes of the upper maxillary and palate bones. Its middle line is marked by an elevated raphé, on each side of which are transverse ridges and grooves.

The *gums* are thick, dense folds of mucous membrane attached to the periosteum of the alveolar processes, and remarkable for their insensibility.

The *tongue* has been already described.

The *soft palate* (velum pendulum palati) is a fold of mucous membrane, with glands and muscles, at the back part of the mouth, continuous above with the hard palate; the *uvula* is a small rounded process hanging from the middle of its inferior border.

The *tonsils* (amygdalæ) are two glandular almond-shaped bodies on each side of the fauces, between folds of the mucous membrane of the soft palate, which are called the *anterior* and *posterior pillars*. They are composed of an assemblage of mucous follicles opening on the surface of the glands.

The *isthmus of the fauces* is the space included between the soft palate and root of the tongue; it is the opening between the mouth and pharynx.

The *salivary glands* communicate with the mouth by their excretory ducts; they are the parotid, submaxillary, and sublingual. The *parotid*, the largest, is situated immediately in front of the external ear, extending deeply behind the ramus of the lower jaw. Embedded in its substance are the external carotid artery, temporo-maxillary vein, and facial nerve. Its excretory duct opens on the internal surface of the cheek opposite the second molar tooth of the upper jaw. The *submaxillary* is situated in the posterior angle of the submaxillary triangle of the neck, and behind the lower jaw. Its excretory duct opens on the papillæ under the tongue, by the side of the frænum linguæ. The *sublingual* is a flattened body beneath the mucous membrane of the floor of the mouth, on each side of the frænum linguæ. Its secretion is poured into the mouth by seven or eight small ducts, which open on each side of the frænum linguæ. In structure the salivary glands are conglomerate, consisting of lobes made up of small lobules, and these of still smaller lobules, the smallest lobule being composed of granules, which are minute cæcal pouches, formed by the dilatation of the extreme ramifications of the ducts.

The Pharynx.—The *pharynx* is a musculo-membranous sac between the mouth and œsophagus. Its anterior part is incomplete, and has opening into it the two posterior nares, the two Eustachian tubes, mouth, larynx, and œsophagus.

The Œsophagus.—The *œsophagus* is the continuation of the alimentary canal from the pharynx to the stomach. In its descending

course along the spine it inclines to the left in the neck, to the right in the upper part of the thorax, and to the left again as it passes through the posterior mediastinum. It terminates at the cardiac orifice of the stomach about the tenth dorsal vertebra.

The Stomach.—The *stomach* is an expansion of the alimentary tube, its *greater* or *splenic end* being situated in the left hypochondriac region, where it is in contact with the concave surface of the spleen, and its *lesser* or *pyloric end* extending into the epigastric region. Above it forms a *lesser curvature*, and below a *greater curvature;* its opening into the œsophagus is the *cardiac orifice*, and its opening into the duodenum the *pyloric orifice*. (See fig. 107.)

The Small Intestine.—The *small intestine* is about twenty-five feet in length, extending from the pylorus to the cæcum. Its first division is the *duodenum*, about twelve fingers' breadth in length. It ascends obliquely backward to the under surface of the liver, then descends perpendicularly in front of the right kidney, and then passes transversely across the third lumbar vertebra. A little below its middle it receives the ductus communis choledochus from the liver, and pancreatic duct from the pancreas. The second division is called *jejunum;* it forms the upper two fifths of the small intestine; it is thicker to the touch than the other portions, and has a pinkish tinge. The third division is the *ileum;* it is smaller in diameter, and thinner in texture, and paler than the jejunum. It opens into the colon at an obtuse angle, in the right iliac fossa.

The Large Intestine.—The *large intestine* is about five feet in length, sacculated in appearance, and divided into the cæcum, colon, and rectum. The *cæcum* is the most dilated portion of the intestinal tube, forming a blind pouch, or cul-de-sac. Attached to its extremity is a worm-shaped tube, from one to five or six inches in length, called *appendix vermiformis;* it is the rudiment of the long cæcum found in all mammiferous animals except man and the higher quadrupeds. The *colon* is divided into *transverse*, *ascending*, and *descending*, and in the right iliac fossa it makes a remarkable curve upon itself, called the *sigmoid flexure*. The *rectum* is the termination of the large intestine; it descends in front of the sacrum, and near the extremity of the coccyx curves backward, and terminates at the *anus*, which is situated a little more than an inch in front of the coccyx. The integument around the anus is covered with hairs, and arranged into numerous radiated plates, which are obliterated during the passage of fæces. (See fig 107.)

Structure of the Alimentary Canal.—The pharynx has mucous, fibrous, and muscular coats; the œsophagus has only mucous and muscular coats; the stomach and intestines have mucous, muscular, and serous coats. The mucous is the internal coat, the muscular the middle, and the serous the external.

The *mucous coat* very closely resembles the cutaneous covering of the exterior; it is composed of three layers, an *epithelium*, a *mucous proper*, and a *fibrous*. The *epithelium* is the epiderma of the mucous membrane. The *proper mucous* layer is analogous to the papillary layer of the skin. In the stomach it forms polyhedral cells, into the floor of which the gastric follicles open; in the small intestine it presents numerous minute projecting papillæ, called *villi*, which give the surface a velvety appearance; in the large intestine the surface resembles the cellular network of the stomach. The *fibrous layer* (formerly called "*nervous coat*") is the membrane of support, as the corium is to the papillary layer of the skin.

The *muscular coat* of the pharynx consists of the muscles already described; that of the rest of the alimentary canal is composed of two planes of muscular fibres, one of which is external and longitudinal, and the other internal and circular.

The *serous coat* is a layer of membrane derived from the peritoneum.

In the œsophagus the mucous membrane is disposed in *longitudinal plicæ;* in the stomach it is formed into plaits, or *rugæ;* at the pylorus it forms a spiral fold, which constitutes a part of the *pyloric valve;* in the lower part of the duodenum, the whole length of the jejunum, and upper part of the ilium, it forms valvular folds, called *valvula conniventes;* at the termination of the ilium in the cæcum it forms two projecting folds, called *ileo-cæcal valve;* in the cæcum and colon it is raised into cresentric folds; and in the rectum it forms three valvular folds.

The *glands* and *follicles* of the intestinal structure are situated in the loose cellular or areolar tissue of the mucous coat, connecting the mucous with the fibrous layer. The *pharyngeal glands* are large and numerous around the posterior nares; the *œsophageal glands* are small lobulated bodies opening upon its surface by a long, oblique excretory duct; the *gastric follicles* are long tubular bodies situated perpendicularly side by side throughout the mucous membrane of the stomach, and intended probably for the secretion of the gastric juice; the *duodenal glands* are small flattened granular bodies, resembling in structure small salivary glands, and opening on the surface by minute excretory ducts; the *solitary glands* are small saccular cavities in the small intestines, without an excretory duct, and in the large intestines

small circular prominences, with a minute excretory opening in the centre; the *aggregate*, or *Peyer's glands*, are circular patches surrounded by simple follicles, near the lower end of the ilium; and the *simple follicles* are small pouches of mucous layer, dispersed in immense numbers over the whole mucous membrane.

The *arteries* of the alimentary canal are the pterygo-palatine, ascending pharyngeal, superior thyroid, and inferior thyroid, in the neck; œsophageal in the thorax; gastric, hepatic, splenic, superior, and inferior mesenteric, in the abdomen; and inferior mesenteric, iliac, and internal pudic, in the pelvis. The *veins* from the abdominal portion of the canal unite to form the vena portæ. The *lymphatics* and *lacteals* open into the thoracic duct. The *nerves* of the pharynx are derived from the glosso-pharyngeal, pneumogastric, and ganglionic; those of the stomach are the pneumogastric, and ganglionic branches from the solar plexus; those of the intestinal canal are the superior and inferior mesenteric and hypogastric plexuses; the extremity of the rectum is supplied by the inferior sacral nerves from the spinal cord.

THE LIVER.

The liver is a large conglomerate gland, and the largest organ in the body, weighing about four pounds, and measuring about twelve inches through its longest diameter. It occupies the right hypochondriac region, and extends across the epigastrium into the left hypochondriac, frequently reaching, by its left extremity, the upper end of the spleen. It is marked anteriorly by a deep notch, which divides it into two lobes. Above and behind it is in relation with the diaphragm, below with the stomach and ascending portion of the duodenum, transverse colon, right supra-renal capsule, and right kidney; its free anterior border corresponds with the lower margin of the ribs.

It is held in its place by five ligaments; the *longitudinal*, a fold of peritoneum extending through its notch; two *lateral*, formed by layers of peritoneum, which connect its lobes with the diaphragm; the *coronary*, formed by the separation of the two layers of the lateral; and the *round*, a fibrous cord resulting from the obliteration of the umbilical vein; this passes through a fissure in its under surface from the umbilicus to the inferior cava.

Its under surface is marked by five fissures; the *longitudinal*, the lower part of which contains the remains of the *ductus venosus*; the *transverse*, through which the hepatic artery, portal vein, and hepatic ducts enter the liver, the *fissure for the gall bladder*, and the *fissure for the vena cava*.

These fissures divide the liver into five lobes; the right, five or six

times larger than the left; the *left*, the *lobus quadratus*, on the under surface of the right lobe; the *lobus spigelii*, a triangular portion, also on the under surface of the right lobe; and the *lobus caudatus*, a small appendage of the former.

The *vessels* and *lymphatics* of the liver have been described; its *nerves* from the animal system proceed from the right phrenic and pneumogastric; those from the organic system are derived from the hepatic plexus.

Minute Anatomy of the Liver.—The liver is composed of lobules, a connecting medium called *Glisson's capsule*, of the ramifications of the *portal vein*, *hepatic duct*, *hepatic artery*, *hepatic veins*, *lymphatics*, and *nerves*, and is enclosed by the peritoneum, and retained in position by its folds.

The *lobules* are small granular bodies, irregular in form, about the size of millet seeds, and, when divided longitudinally, have a foliated appearance. Each lobule is composed of a plexus of biliary ducts, of a venous plexus formed by branches of the portal vein, of a hepatic vein, and of minute arteries; nerves and absorbents are also supposed to enter into their formation, but have not been traced into them. To microscopic examination a lobule presents numerous minute bodies of a yellowish color and various forms, connected with each other by vessels; these minute bodies are the *acini* of Malpighi.

The branches of the *portal vein* are distributed through canals channeled in every part of the organ. This vein brings the returning blood from the chylopoietic viscera, and also conducts the venous blood from the ultimate ramifications of the hepatic artery; its branches in the canals are called *vaginal*, and form a venous *vaginal plexus;* these give off *interlobular branches*, and the latter enter the lobules and form *lobular venous plexuses;* from the blood circulating in these plexuses the bile is secreted.

The *bile* in the lobule is received by a network of minute ducts, the *lobular biliary plexus;* from the lobule it is conveyed into *interlobular ducts;* and these proceed into the biliary *vaginal plexus* of the portal canals, and thence into the excreting ducts, by which it is carried into the duodenum and gall-bladder, after being mingled in its course with the mucous secretion from the numberless muciparous follicles in the walls of the ducts.

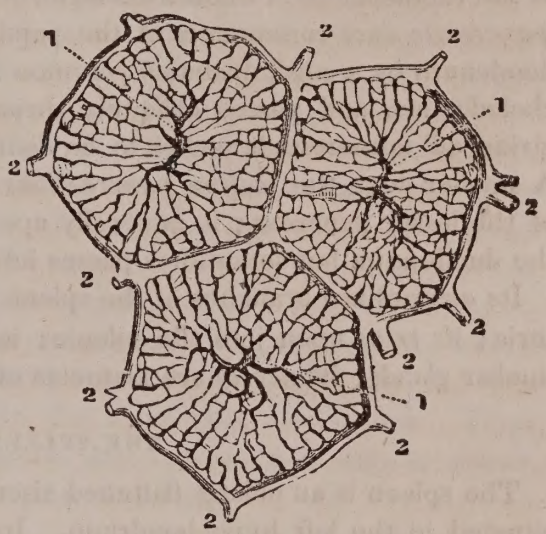
The *hepatic artery* distributes branches through all the portal canals, gives off *vaginal branches*, which form a vaginal hepatic plexus, from which the *interlobular* branches arise, and these latter terminate ultimately in the lobular venous plexuses of the portal vein. The artery

ramifies abundantly in the coats of the hepatic ducts, supplying materials for their mucous secretion, and for the nutrient vessels of the entire organ.

The *hepatic veins* commence in the centre of each lobule by minute radicles, which collect the impure blood from the lobular venous plexus, and convey it into the *interlobular veins;* these open into veins called *sublobular*, and the sublobular unite to form the large hepatic trunks by which the blood is conveyed into the vena cava.

An important physiological deduction from the anatomical structure of the liver is, that bile is wholly secreted from venous blood, and not from a mixture of venous and arterial blood, as stated by Muller; and an equally important pathological inference is, that bile is wholly an excrementitious fluid, and not "auxiliary to digestion," as many physiologists suppose.

Fig. 116.



LOBULES OF THE LIVER.

Fig. 116 is a horizontal section of three superficial lobules, showing the two principal systems of blood-vessels.

THE GALL-BLADDER.—The *gall-bladder* is a pyriform sac, which serves as a reservoir for the bile. It is situated on the under surface of the right lobe of the liver, and composed of serous, fibrous, and mucous coats. Its mucous coat is raised into minute rugæ, which form a spiral valve at the neck of the sac.

The *biliary ducts* are three: the *ductus communis choledochus*, which is the common excretory duct of the liver and gall-bladder, about three inches long, and about the size of a crow-quill, commences at the middle of the duodenum, and before reaching the liver divides into the *cystic*, which is about an inch in length, and enters the neck of the gall-bladder, and the *hepatic*, which continues onward to the transverse fissure, where it divides into two branches, which ramify through the portal canals to all parts of the liver.

THE PANCREAS.

The *pancreas* sweet-bread) is a long, flat, conglomerate gland in

structure and function analogous to the salivary glands. It is about six inches long, weighs about four ounces, situated transversely across the abdomen behind the stomach, opposite the first and second lumbar vertebræ. Its greater end, or head, is placed toward the right, surrounded by the curve of the duodenum; the lesser end extends to the left as far as the spleen. Upon the posterior part of its head is a lobular fold, called the *lesser pancreas*.

In *structure* the pancreas is composed of reddish-yellow polyhedral lobules, these consisting of smaller lobules, and these again composed of the ramifications of minute ducts, terminating in cæcal pouches. The *pancreatic duct* commences at the papillæ on the inner surface of the duodenum by a small dilatation common to it and the ductus communis choledochus, and passes obliquely through the middle of the gland, giving off numerous branches to be distributed through its substance. A smaller duct, the *ductus pancreaticus minus*, receives the secretion of the lesser pancreas; it generally opens into the principal duct near the duodenum, but sometimes passes into that intestine separately.

Its *arteries* are branches of the splenic, hepatic, and superior mesenteric; its *veins* open into the splenic; its *lymphatics* terminate in the lumbar glands; its *nerves* are filaments of the splenic plexus.

THE SPLEEN.

The spleen is an oblong flattened viscus, of a dark, bluish-red color, situated in the left hypochondrium. Its size and weight are variable; its texture is exceedingly spongy, vascular, and friable. Its internal surface is marked with several large irregular openings for the entrance and exit of vessels; this is the *hilus lienis*. A second spleen is sometimes found appended to one of the branches of the splenic artery, about the size of a hazel nut, and occasionally two and three of these bodies have been found.

The spleen is profusely supplied with blood; the *splenic artery* is very large in proportion to the bulk of the organ, and its branches are distributed to distinct sections, sparingly anastomosing with each other. The *veins*, by their numerous dilatations, form most of its bulk; their blood is poured into the splenic vein, which is one of the trunks that form the portal. The *lymphatics* are remarkable for their number and large size, and terminate in the lymphatic glands. Its *nerves* are the splenic plexus, derived from the solar.

The function of the spleen is unknown. Most physiologists have conjectured that it was in some way auxiliary to digestion; others, with more probability, have regarded it as a sort of brain-appendage to the organic nervous system. This hypothesis is strengthened by its pecu-

lar structure, which has many points of resemblance both to secernent glands and the cerebro-spinal substance; and by the absence of an excretory duct.

THE SUPRA-RENAL CAPSULES.

The *supra-renal capsules* are two small, yellowish, flattened bodies, surmounting the kidneys, and inclining toward the vertebral column. The right is triangular in shape, the left semilunar; they are connected to the kidneys by the common cellular tissue and a fissure on the anterior surface divides each capsule into two lobes. Both capsules rest against the curve of the diaphragm on a level with the tenth dorsal vertebra. They are larger in the fœtus than in the adult, and are supposed to perform some function connected with embryonic life.

Their structure is composed of cortical and medullary substances. Their *arteries*, derived from the aorta, renal and phrenic arteries, are remarkable for the innumerable minute twigs into which they divide before entering the capsule. The *supra-renal vein*, whose large trunk in its centre gives the capsule the appearance of a central cavity, collects the blood from the medullary venous plexus, and receiving several branches which pierce the cortical layer, opens directly into the vena cava on the right side, and into the renal vein on the left. Their *lymphatics* are large and numerous, and terminate in lumbar glands. The *nerves* are derived from the phrenic plexus.

THE KIDNEYS.

The secreting organs of the urine are situated in the lumbar regions, behind the peritoneum, and on each side of the vertebral column, which their upper extremities approach. Each kidney is between four and five inches long, two and a half broad, about an inch thick, weighing from three to five ounces. The *right kidney* is somewhat lower than the left, from the position of the liver; the *left* is covered in front by the great end of the stomach and the spleen.

The structure of the kidney is dense and fragile, and when divided presents an external, vascular, or cortical, and an internal, tubular, or medullary substance. The *tubular* portion is formed of pale-reddish conical masses, and the *vascular* portion of blood-vessels and plexiform convolutions of uriniferous tubuli, which not only constitute the surface, but dip between the cones and surround them nearly to their apices.

The cones, or pyramids, are composed of minute straight tubuli uriniferi, of a diameter not exceeding that of a fine hair, which commence at the apices of the cones, and bifurcate from point to point toward the circumference of the kidney.

Fig. 117.

SECTION OF THE KIDNEY.

Fig. 117 is a section of the kidney surmounted by the supra-renal capsule; the swellings on the surface mark its original constitution in distinct lobes. 1. Supra-renal capsule. 2. Vascular portion. 3, 3. Tubular portion, consisting of cones. 4, 4. Two of the papillæ projecting into their corresponding calices. 5, 5, 5. The three infundibula; the middle 5 is situated in the mouth of a calyx. 6. Pelvis. 7. Ureter.

In the cortical portion are contained a multitude of very small, red, globular bodies, called *glomeruli*, or *corpora Malpighiana*, each of which is composed of a plexus of capillary vessels, and a coil of uriniferous tubule, both enclosed in a thin membranous capsule. The cones of the interior are invested by mucous membrane, which is continuous at their apices with the uriniferous tubuli, and is reflected from their sides so as to form around each a cup-like pouch, or *calyx*. The calices communicate with a common cavity of large size at each extremity and in the middle, and three cavities, called the *infundibula*, unite and form a membranous sac, which occupies the hilus renalis, the *pelvis* of the kidney.

The excretory duct of the kidney is called *ureter;* it is a membranous tube about as large as a goose-quill, and nearly eighteen inches long; it is situated behind the peritoneum, crossed by the spermatic vessels, and in its course downward crosses the common iliac artery and vein, and then the external iliac vessels; within the pelvis it crosses the umbilical artery and vas deferens in the male, and the upper part of the vagina in the female, and terminates upon the internal surface of the bladder. Sometimes there are two ureters to one kidney.

Mr. Bowman, who has investigated the intimate structure of the kidneys, thinks there are two distinct systems of capillary vessels, through both of which the blood passes in its course from the arteries into the veins, and that certain saline substances and morbid products, as sugar and albumen, which escape from the system through the urine, and also the principal constituents of urine, such as urea, lithic acid, etc., are, like the bile in the liver, derived from venous blood.

THE PELVIC VISCERA.

The cavity of the pelvis is the lower portion of the abdominal cavity; it is included within the bones of the pelvis, below the level of the linea-ilio-pectinea and the promontory of the sacrum. The male pel-

ric viscera are the urinary bladder, prostate gland, vesicula seminales, and rectum.

The *bladder* is an ovoid-oblong membranous sac, situated behind the ossa pubis and in front of the rectum. Its middle portion is called the *body;* its upper segment the *fundus;* its broad surface resting on the rectum, the *base;* and the narrow constricted portion against the prostate gland, the *neck.*

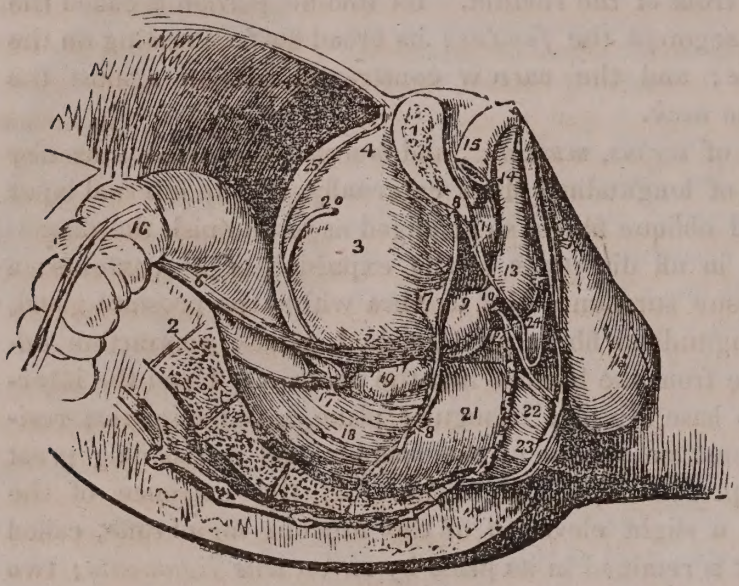
It is composed of *serous*, *muscular*, and *mucous* coats; the muscular coat is composed of longitudinal fibres externally, and an internal layer of transverse and oblique fibres, so arranged as to diminish the diameter of the viscus in all directions in the expulsion of its contents; a ring of elastic tissue surrounds the urethra within the prostate gland, to which the longitudinal fibres are attached, whose contraction enlarges the passage from the bladder into the urethra. Upon the internal surface of its base is a pale triangular plane, called *trigonum vesicale*, the most sensitive portion of the bladder, and occasioning great suffering when pressed upon by calculi. At the entrance of the urethra there is a slight elevation of the mucous membrane, called *uvula vesicæ.* It is retained in its place by seven *true ligaments;* two *anterior*, formed by the pelvic fascia; two *lateral*, formed by a reflection of the pelvic fascia and levatores ani muscles upon the sides of its base; two *umbilical*, the fibrous cords resulting from the obliteration of the umbilical arteries of the fœtus; the *urachus*, a small fibrous cord, formed by the obliteration of a tubular canal existing in embryo, attached to the apex of the bladder, and thence ascending to the umbilicus; and four *false ligaments*, which are folds of peritoneum, the two *lateral* corresponding with the passage of the vasa deferentia from the sides of the bladder to the internal abdominal rings, and the two *posterior* with the course of the umbilical arteries to its fundus.

The external surface of the bladder corresponding with the trigonum is triangular, and separated from the rectum merely by a thin layer of fibrous membrane, the *recto-vesical fascia.* It is through this space, bounded behind by the recto-vesical fold of peritoneum, and on each side by the vas deferens and vesicula seminalis, which converge almost to a point at the base of the prostate gland, that the opening is made in the recto-vesical operation for puncturing the bladder.

The *prostate gland* is situated in front of the neck of the bladder, and upon the rectum, through which it may be felt with the finger, surrounding the commencement of the urethra for a little more than an inch of its extent, in size and form resembling a Spanish chestnut. It consists of two lateral lobes, and a middle lobe or isthmus, and its structure is composed of ramified ducts, terminating in lobules of fol-

licular pouches. Its secretion is poured into the prostatic portion of the urethra by fifteen or twenty excretory ducts.

Fig. 118.



VISCERA OF THE PELVIS.

Fig. 118 is a side view of viscera of the male pelvis. 1. Divided surface of the os pubis 2. Divided surface of the sacrum. 3. Body of the bladder. 4. Its fundus; the urachus is seen passing upward from the apex. 5 Its base. 6. Ureter 7. Neck of the bladder. 8, 8. Pelvic fascia; the fibres above 7 are given off from the pelvic fascia, and represent the anterior ligaments of the bladder. 9. Prostate gland. 10. Membranous portion of the urethra, between the two layers of the deep perineal fascia. 11. The deep perineal fascia, formed of two layers. 12. One of Cowper's glands, between the layers and beneath the membranous portion of the urethra. 13. Bulb of the corpus spongiosum. 14. Body of the corpus spongiosum. 15. Right crus penis. 16. Upper part of the first portion of the rectum. 17. Recto-vesical fold of peritoneum. 18. Second portion of the rectum. 19. Right vesicula seminalis. 20. Vas deferens. 21. The rectum covered by the descending layer of the pelvic fascia, just as it is making its bend backward to constitute the third portion. 22. Part of the levator ani muscle investing the lower part of the rectum. 23. External sphincter ani. 24. Interval between the deep and superficial perineal fascia; they are seen to be continuous beneath the number.

The *vesiculæ seminales* are lobulated bodies, about two inches in length, situated on the under surface of the base of the bladder, and separated from the rectum only by the recto-vesical fascia. Each vesicula is formed by convolutions of a single tube, which gives off several irregular cæcal branches; it is enclosed in a dense fibrous membrane, derived from the pelvic fascia, and is constricted beneath the isthmus of the prostate gland into a small excretory duct. The *vas deferens* of the testis, somewhat enlarged and convoluted, lies along the inner border of each vesicula, and is included in its fibrous investment. It communicates with the duct of the vesicula, beneath the isthmus of the prostate, and forms the *ejaculatory duct*, which is about three fourths of an inch in length, and opens on the mucous membrane of the urethra.

The *penis* and *testes*, with their appendages, constitute the male organs of generation. The *penis* is divided into a head, the anterior extremity of which is the *glans*, a *root* which is strongly adherent to the pelvis, and an intervening *body*, consisting of two structures, called *corpus cavernosum* and *corpus spongiosum*. The integument of the penis is thin, and destitute of adipose matter. Surrounding the glans is a loose doubling, called the *prepuce;* this is connected to the orifice of the urethra by a process called *frænum;* the edge around the base of the glans is called *corona glandis;* the *glands of Tyson* are small papillary elevations around the base of the glans; their secretion is called *smegma;* the fascia is situated beneath the skin, and is but a modification of the superficial abdominal fascia; a portion connecting the penis with the pubis is called *ligamentum suspensorium*.

The largest part of its *body* is formed by the *corpus cavernosum*, which in shape resembles a double cylinder; these cylinders, separated and pointed at the root, are there called the *crura*, each *crus* being firmly attached to the ramus of the pubis and ischium. Externally this structure is covered by a thick fibro-elastic coat, and internally of erectile tissue. The partial separation of the two cylinders is called *septum pectiniforme*. The *corpus spongiosum* is situated along the under surface and in the inferior groove of the corpus cavernosum. Its posterior extremity is enlarged into the *bulb*, and its anterior is expanded into the *glans*. It is composed of erectile tissue, a peculiar cellulo-vascular structure entering largely into the composition of the organs of generation, and contains in its interior the spongy portion of the urethra.

The *urethra* is the urinary canal from the bladder through the penis. Its structure is membranous, composed of mucous and elastic-fibrous coats. Its diameter varies in different parts of its course, which is somewhat curved. The first portion is called the *prostatic urethra;* this is about an inch in length; on its lower surface is a longitudinal fold of mucous membrane, called *veru montanum*, or *caput gallinaginis;* on each side of this a depression called *prostatic sinus*, into which the prostatic ducts open; at the anterior extremity of the veru montanum are the openings of the ejaculatory ducts. The next portion is *membranous;* this is eight or ten lines in length, and very narrow, surrounded by loose tissue and a few muscular fibres. The rest is the *spongy* portion, six or seven inches in length; it is narrowest in the body of the organ; posteriorly it is dilated into the bulb, forming the *bulbous urethra*, and anteriorly in the glans it enlarges into the *fossa navicularis*. The external opening, *meatus urinarus*, is the most constricted portion of the canal, so that a catheter which will enter

that opening will pass freely through the whole extent of a healthy urethra.

Cowper's glands are two small lobulated bodies, about the size of peas, situated beneath the membranous portion; their excretory ducts open into the bulbous portion. The whole internal surface of the spongy portion of the urethra is marked with *lacunæ*, or openings of mucous glands situated in the submucous cellular tissue. These openings are directed forward, and sometimes obstruct the point of a small catheter in its passage to the bladder.

The *testes* are glandular organs suspended from the abdomen by the spermatic cord, and enclosed in an integument called the scrotum. The *scrotum* is composed of a *tegumentary layer*, extremely thin, transparent, and corrugated, and beset with hairs having very prominent roots, and a proper covering called *dartos*, a fibro-muscular tissue, which sends inward a partition, *septum scroti*, which divides it into two cavities for the two testes.

The *spermatic cord*, composed of arteries, veins, nerves, lymphatics, the excretory duct of the testicle, and investing tunics, is the medium of communication between the testes and interior of the abdomen. It commences at the internal abdominal ring, where the vessels composing it converge, and passes obliquely along the spermatic canal, escaping at the external abdominal ring, and descending through the scrotum to the posterior border of the testicle. The excretory duct of the testicle is called *vas deferens;* its coats are thick and tough, and it may be distinguished along the posterior border of the spermatic cord by the hard and cordy sensation it communicates to the fingers.

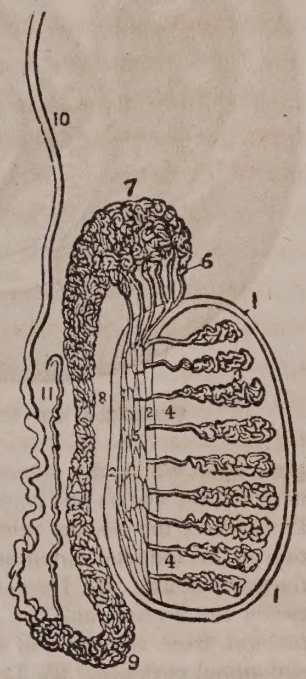
Each *testis* is an oblong rounded gland suspended in the cavity of the scrotum by the spermatic cord; its function is to secrete the seminal fluid. Encircling its posterior edges is a soft flattened body, called *epididymis;* it is formed by the convolutions of the excretory seminal ducts; its upper extremity is called *globus major*, and the lower *globus minor;* this extremity curves upward and becomes continuous with the vas deferens. The testis has three coverings, a serous coat called *tunica vaginalis;* a thick, middle, fibrous membrane, called *tunica albuginea*, which surrounds the testis, and is reflected into its interior, forming the *mediastinum testis*, from which numerous fibrous cords, *trabeculæ septula*, are given off; and an internal nutrient membrane called *tunica vasculosa*, which, analogous to the disposition of the pia mater in the brain, sends processes inward between the lobules of the organ.

The substance of the testis consists of numerous flattened lobules, with their bases toward the surface. Krause counted between four

and five hundred of them. Each lobule is invested in a distinct sheath, formed of two layers, one from the tunica vasculosa, and the other from the tunica albuginea, and composed of several minute tubuli, *tubuli seminiferi*, exceedingly convoluted, frequently anastomosing near their extremities, and terminating in loops or cæcal ends of about $\frac{1}{170}$ of an inch in diameter. The tubuli seminiferi are of a bright yellow color, become less convoluted in the apices of the lobules, and terminate by forming from twenty to thirty small straight ducts of about twice the diameter of the tubuli seminifera; these ducts are the *vasa rectæ*.

Fig. 119 represents the minute structure of the testis. 1, 1. Tunica albuginea. 2, 2. Mediastinum testis. 3, 3. The lobuli. 4, 4. Vasa recta. 5. Rete testis. 6. Vasa efferentia; six of them only are shown in the diagram. 7. Cervi vasculosi, constituting the globus major of the epididymis. 8. Body of the epididymis. 9. Its globus minor. 10. Vas deferens. 11. Vasculum aberrans.

Fig. 119.



ANATOMY OF THE TESTIS.

The vasa recta enter the mediastinum, and terminate in from seven to thirteen smaller ducts, which pursue a waving course from below upward, through the fibrous tissue of the mediastinum, and communicate freely with each other, constituting the *rete testis*. The ducts of the rete testis terminate at the upper extremity of the mediastinum in small ducts called *vasa efferentia;* these vary in number from nine to thirty, and form, by their convolutions, numerous conical masses, the *coni vasculosi;* from the bases of these cones larger-sized tubes proceed, whose complex convolutions form the body of the epididymis.

THE FEMALE PELVIS.

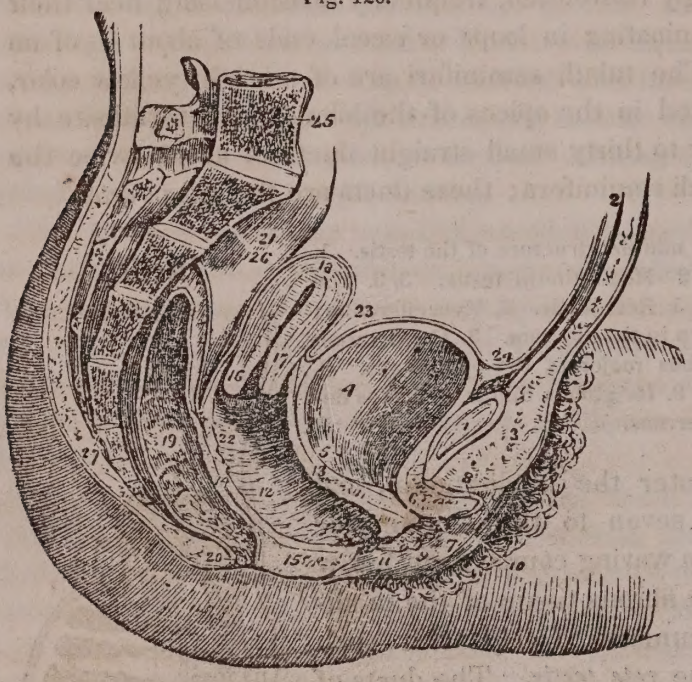
The viscera of the female pelvis are the bladder, vagina, uterus and its appendages, the rectum, and some portion of the small intestines, which occupy the upper part of the cavity.

The *bladder* is situated behind the ossa pubis and in front of the uterus; it is broader than in the male, corresponding with the broader pelvis.

The *urethra* is about an inch and a half in length, and is lodged in the upper wall of the vagina, in its course downward and forward beneath the arch of the os pubis, to the meatus urinarius. It is surrounded by a proper coat of elastic tissue, to which the muscles of the

detrusor urinæ are attached, and to which the remarkable dilatability of the female urethra is owing.

Fig. 120.



VISCERA OF THE FEMALE PELVIS.

Fig. 120 is a side view of the viscera of the female pelvis. 1. Symphysis pubis, to the upper part of which the tendon of the rectus muscle is attached. 2. Abdominal parieties. 3. Collection of fat, forming the prominence of the mons Veneris. 4. Bladder. 5. Entrance of the left ureter. 6. Canal of the urethra, converted into a mere fissure by the contraction of its walls. 7. Meatus urinarius. 8. Clitoris, with its præputium, divided through the middle. 9. Left nympha. 10. Left labium majus. 11. Meatus of the vagina, narrowed by the contraction of its sphincter. 12, 22. Canal of the vagina, upon which the transverse rugæ are apparent. 13. The thick wall of separation between the vagina and rectum. 15. The perineum. 16. Os uteri. 17. Its cervix. 18. Its fundus; the cavitas uteri is seen along its centre. 19. Rectum, showing the disposition of its mucous membrane. 20. Anus. 21. Upper part of the rectum, invested by the peritoneum. 23. Utero-vesical fold of peritoneum; the recto-uterine fold is seen between the rectum and the posterior wall of the vagina. 24. The reflexion of the peritoneum, from the apex of the bladder upon the urachus to the internal surface of the abdominal parieties. 25. Last lumbar vertebra. 26. Sacrum. 27. Coccyx.

The *vagina* is a membranous canal leading from the vulva to the uterus; its structure is composed of *mucous*, *erectile*, and *contractile fibrous tissues*. The mucous membrane is marked by a number of transverse papillæ, or *rugæ*, and is covered by a thin cuticular epithelium, which is continued from the labia to the middle of the cervix uteri.

The *uterus* is a flattened, pear-shaped organ, occupying the upper part of the pelvic cavity between the bladder and rectum. Its *fundus* and *body* are enclosed in a duplicature of peritoneum, which forms a transverse septum between the bladder and rectum, the folds of which, on either side of the uterus, are its *broad ligaments*. Its lower portion is the *cervix*; around the circumference the upper end of the

vagina is attached; its opening into the vagina is the *os uteri*. Its structure consists of an external *serous* coat, derived from the peritoneum, a middle *muscular* coat, and an internal coat of *mucous membrane*. The muscular coat gives it density and bulk, and in the unimpregnated state is exceedingly firm in texture, appearing to be composed of whitish fibres, inextricably interlaced and mingled with blood-vessels. During pregnancy the fibres become large and distinct, and disposed in two layers. The *superficial layer* consists of vertical fibres, some of which are longitudinal and others oblique. The *deep layer* consists of two hollow cones of circular fibres, having their apex at the openings of the Fallopian tubes, and intermingling by their bases on the body of the organ. Around the cervix they assume a circular form, and interlace at right angles.

Its *arteries* are the uterine from the internal iliac, and the spermatic from the aorta. Its *veins* are large, and in the unimpregnated state are called sinuses, being canals channeled through the substance of the organ, and lined by the mucous membrane. They terminate in the uterine plexuses on each side. The *lymphatics* terminate in the lumbar glands. The *nerves* are derived from the hypogastric, spermatic, and sacral plexuses. Dr. Robert Lee, after making the nervous structure of the uterus a subject of special investigation, concludes that "The human uterus possesses a great system of nerves, which enlarges with the coats, blood-vessels, and absorbents, during pregnancy, and which returns after parturition to its original condition before conception takes place."

The *appendages of the uterus* are the Fallopian tubes and ovaries, enclosed by the lateral duplicatures of the peritoneum, which constitute the broad ligaments.

The Fallopian tubes are the oviducts by which the impregnated ovum is conveyed to the uterus. Each tube is four or five inches in length; its canal is exceeding small; its opening into the uterus is called *ostium uterinum*, and that of its outer or free extremity, *ostium abdominale;* this end has a fringed-like appendage, called *fimbriæ*, and is connected with the ovary by a short ligamentous cord, by which it is conducted to the surface of the ovary during sexual excitement. The coats of the tubes are *peritoneal*, *muscular*, and *mucous*.

The *ovaries* are oval, flattened, whitish bodies, situated in the posterior layer of peritoneum of the broad ligament, and connected to the upper angles of the uterus by a rounded cord, called the *ovarian ligament*. In structure each ovary is composed of cellulo-fibrous parenchyma or stroma, traversed by blood-vessels, and enclosed in a capsule consisting of vascular, fibrous, and serous layers. In the cells of the

stroma the small vesicles or ovisacs of the future ova, the *Graafian vesicles*, are developed. Each ovary contains about fifteen fully formed vesicles, although innumerable microscopic ovisacs exist in the parenchyma. A yellow spot or cicatrix, called *corpus luteum*, is found in one or both ovaries after conception. A *false corpus luteum* is sometimes met with in the ovaries of virgins; it is of a similar appearance, but smaller in size and without a central cavity.

The *external organs of generation* in the female are the mons Veneris, labia majora, labia minora, and clitoris; the internal being the vagina, uterus, ovaries, and Fallopian tubes, which have been described.

The *mons Veneris* is the prominent integument upon the front of the ossa pubis; its cellular tissue is loaded with adipose substance, and the surface covered with hair. The *labia majora* are longitudinal folds of adipose cellular tissue and integument, which form the common urino-sexual opening, or *vulva*. The *labia minora*, or *nymphæ*, are smaller folds, situated within the former. The *clitoris* is a small elongated body, situated in front of the ossa pubis, analogous to the corpus cavernosum of the penis, and, like it, arises by *crura* from the pelvis; its extremity is called its *glans*. The entrance of the vagina is about an inch behind the clitoris; it is closed in virgins by a partial membrane stretched across the opening; this is called the *hymen;* it is extremely variable in its form and appearance, and not unfrequently is entirely wanting. Sometimes it is imperforate, and occasionally it is so firm as to require a surgical trans-section. Frequently there is the appearance of a fringe of papillæ, *carunculæ myrtiformes*, around the opening of the vagina, which are the remains of a rudimentary or ruptured hymen. The *meatus urinarius* is situated behind the clitoris, and immediately in front of, and surrounded by, a tubercle at the upper angle of the vagina, and formed by the prominence of its upper wall.

THE MAMMARY GLANDS.

The *mammæ* exist in a rudimentary state in the male, and form a part of the reproductive system of the female. They are situated in the pectoral region, and only separated from the pectoralis major muscle by a thin fascia. The base of each mamma is somewhat elliptical; the anterior aspect is convex, having a central prominence of integument, called the *nipple*, surrounded by a colored areola. In structure it is a conglomerate gland, consisting of lobes held together by firm cellular tissue; the lobes are composed of lobules, and those of minute cæcal vesicles, which are the ultimate termination of the excretory ducts. The excretory ducts *tubuli lactiferi*, are ten to fifteen in

number, commencing by small openings at the apex of the nipple, and passing inward parallel with each other to the central part of the organ, where they form dilatations, *ampullæ*, and give off numerous branches to ramify through the gland to their ultimate termination in the minute lobules. The ducts and cæcal vesicles, in common with all others in the body, are lined by mucous membrane.

GENERAL ANATOMY OF THE FŒTUS.

The medium weight of a child of the full period is about seven pounds, and its length seventeen inches. The head is disproportionately large, and greatly lengthened from before backward, while the face is small. The chest is fully expanded, and the upper extremities well developed. The great size of the liver renders the upper part of the abdomen large and prominent; the lower part is small and conical, and the lower extremities very small comparatively.

The *osseous system* is to a great extent soft and cartilaginous. The bones of the head are separated by spaces where the ossification has not yet taken place, allowing them to move upon and even overlap each other.

The *muscular system* is well developed at birth, the muscles being generally large and fully formed. Their color is lighter, and their texture softer than in the adult. On the fibres of animal life the transverse striæ are not distinguishable until the sixth month of fœtal life.

The *vascular system* presents many peculiarities. The two auricles of the heart communicate by means of the *foramen ovale*. There is a communication between the pulmonary artery and descending aorta by means of a large trunk, the *ductus arteriosus*. The internal iliac arteries are continued to the placenta, by which the fœtal blood is returned to the placenta for revivification. There is also a communication between the umbilical vein and the inferior vena cava, the *ductus venosus*.

In the *nervous system* the brain is very soft, almost pulpy, but the nerves are firm and well developed.

The *eye* and *ear* of the organs of sense are large and fully developed, while the internal structure of the *nose* is very imperfectly developed

The *lungs* are dense and solid in structure until inflated by the act of inspiration. The lung is proportionately large, and early developed, at first appearing like a simple vessel, but gradually becoming more complicated until perfected at birth. The two auricles communicate with each other until the moment of birth. There is also a communication between the pulmonary artery and aorta, called *ductus arteriosus*.

In the fœtal circulation the *pure* blood is brought from the placenta by the umbilical vein, which passes through the umbilicus and enters the liver, dividing these into numerous branches.

Of the abdominal viscera, the *liver* is first formed; the *stomach* and *spleen* are comparatively small, the *pancreas* large; the large intestines are filled with a greenish viscous secretion, called *meconium*.

NOTE.—The particular anatomy and physiology of the fœtus will be given in Part VIII.

PART II.

PHYSIOLOGY.

Definitions.—Physiology is the doctrine of the functions. It explains the actions and uses of the various organs and parts of the living body in its healthy or *normal* condition. Its *abnormal* or diseased states belong to the department of pathology. The functions have been divided into various classes, and each class admits of numerous subdivisions. The ancient physiologists divided them into *vital*, *animal*, and *natural*, corresponding to *nutritive*, *mental*, and *excretory* processes. Some modern authors have adopted Bichat's arrangement into *individual* and *social*, the former being subdivided into *animal* and *organic*. In general terms, *innervation*, *circulation*, and *respiration* are called *vital functions;* while these with *digestion*, *absorption*, *assimilation*, *secretion*, and *calorification*, are regarded as *nutritive functions; sensation*, *voice*, *muscular motion*, and *mental manifestation* constitute the *animal* or *relative functions;* and *generation* is the *reproductive function*.

CHAPTER I.

OF THE TISSUES.

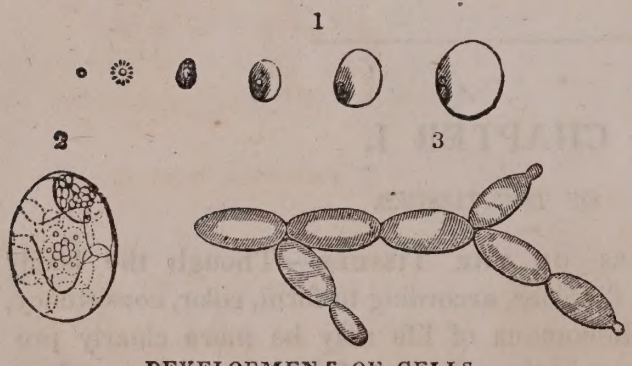
General Characters of the Tissues.—Though the bodily structures admit of many divisions, according to form, color, consistency, and arrangement, the phenomena of life may be more clearly presented by considering them in the relations of primary and secondary The *primary* tissues are the *cellular* or *areolar*, *muscular*, and *nervous* The vital property of the cellular substance is *elasticity*, of the muscular *contractility*, and of the nervous *sensibility*. Distinguished chemically, *gelatin* is the prevailing quality of the cellular tissue, *fibrin* of the muscular and *albumen* of the nervous. The cellular structure

supplies the body with materials of form, the muscular furnishes the agents of action, and the nervous provides the instruments of feeling. The secondary tissues are *membranes*, *ligaments*, *cartilages*, and a portion of the *bones*, *hair*, and *nails*, being various forms of cellular or gelatinous substance in different degrees of density.

The varied forms of all animal and even vegetable tissues are constituted of aggregations of two kinds of cells, variously modified. The cells are called *formative* and *secreting;* the only difference between them is, the former secretes a solid or semi-solid substance, which remains in the body with the debris of the cell for an appreciable time, and the latter secretes a fluid which escapes from the body with the remains of the cell which produced it. Each of these little cell-bodies has been compared to a laboratory, which receives from the surrounding matter the elements which it requires, and combines them so as to accomplish a desired result.

Development of Cells.—A cell originates in a mass of soft or liquid matter which is formed of a combination of elements capable of being fitted into an organized structure. The matter is called *blastema.* In this blastema a minute point arises, which gradually increases in size, while a transparent wall springs up from one side of the point or granule, and continues to swell until the granule is seen to exist in and adhere to one side of the cell wall. Thus is formed the cell wall, with its fluid contents, and the granule or nucleus which, in a further stage of development, exhibits in its interior several new granules or nucleoli.

Fig. 121.



DEVELOPMENT OF CELLS.

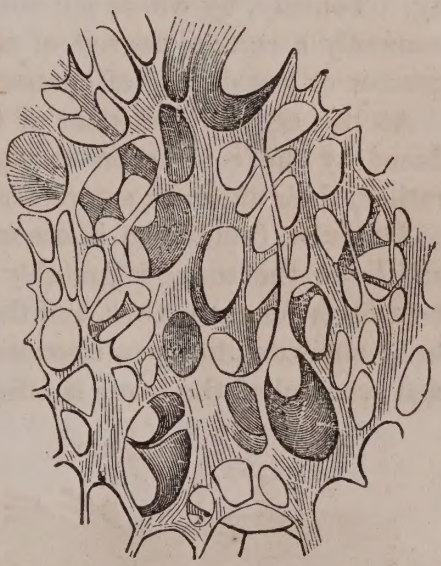
The development and multiplication of cells are represented in fig. 121. 1. Development of cell from the blastema. On the left is seen the corpuscle which becomes the nucleus; on the right the complete nucleated cell. 2. Development of new cells within the parent cell. 3. Development of new cells from the outer wall of pre-existing cells.

The cells undergo various transformations in the production of the different structures. They may lose their fluid contents, and their walls, by collapsing and adhering together form simple, membranous, transparent disks They also elongate, so as to form tubes or solid rods; in the former case they adhere by their ends to neighboring cells, and their cavities

mutually open into each other, forming a vessel; in the latter case the contained fluid is lost, and a solid rod or fibre is the result. The cavities of cells may be obliterated by solid deposits within them, as in the formation of cartilage.

THE CELLULAR TISSUE.—The cellular or areolar tissue is the simplest form of animalized matter. It is flexible and adhesive, yet these properties seem to be included in the general term, elasticity. It pervades and connects together every part of the system, and being composed of membranous layers irregularly joined, so as to form numerous interstices of various capacities, air introduced under the skin may diffuse itself all over the surface of the body, a circumstance often resulting from wounds of the lungs.

Fig. 122.



AREOLAR TISSUE.

The cellular tissue is not composed of a congeries of distinct, isolated cells, but of cavities and interstices freely communicating with each other; hence the term *areolar* is generally applied to this structure by late authors. There are two kinds of this tissue, called *reticular* and *adipose*. The former is dispersed throughout the entire body, except the brain, the bones, and humors of the eye. It is scarcely perceptible in the tendons of muscles, but plentiful in their fleshy parts. The adipose portion is a connection of fibres running in various directions so as to form cavities, which have been called cells; into these cavities the fatty or oily matters are deposited. In some parts of the body it is merely a network of slender fibres, which give pliability and looseness. In other places it is more or less loaded with oil.

The uses of the areolar structure are, to give form and symmetrical smoothness to the body by filling up the interstices, defend the various organs and parts against pressure, connect different parts so as to admit of some degree of sliding motion between them, and serve as a bed for more tender organs, as the eye. It also relieves the body, to some extent, of the immediate bad effects of excessive alimentation, by affording a reservoir for surplus animal fat. It is a common error to suppose

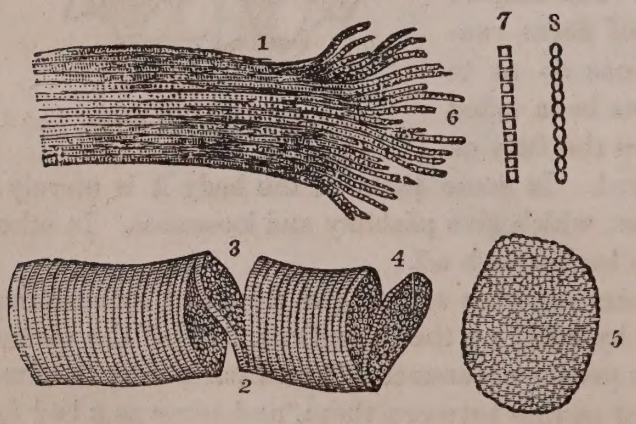
that persons who increase in bulk after having attained maturity of growth, acquire more *flesh*. They are merely burdened with a useless load which should have been expelled as waste matter. The areolar structure is very readily regenerated when destroyed.

The Muscular Tissue.—The muscular or fibrinous tissue is of a higher grade of organization. Physiologists ascribe to it the vital properties of *contractility*, *irritability* or *excitability*, and *tonicity*; but to my mind, one term includes all the others. They are all merely expressions of the power of the muscular fibre to act, move, contract, upon the application of exciting causes. Muscles are said to be impressible to stimuli, and to contract when so impressed, by which motion or action is produced. The term contractility seems to imply impressibility—the susceptibility to be acted on and the action itself. Irritability and excitability are but different names for this susceptibility. Tonicity, by which physiologists mean the ability to maintain permanently a certain degree of contractility, is certainly nothing but a greater or less degree of contractile energy.

All the actions or motions of the various parts and organs are produced by the contraction or shortening of these muscular fibres, or rather, their alternate contraction and expansion.

Muscular contraction is accompanied with the production of *souna* and *heat*; the sound is probably owing to the movement of the adjacent fibres on each other, and the elevation of temperature is doubtless to be attributed to those chemical changes by which the disintegration and renewal of the tissue is effected.

Fig. 123.



MAGNIFIED FRAGMENTS OF MUSCULAR FIBRES.

In Fig. 123 are represented fragments of striped elementary fibres, and showing a cleavage in opposite directions. 1. Longitudinal cleavage. 2, 3, 4. Transverse cleavage forming disks. 5. A detached disk, showing the primitive particles, called sarcous elements. 7, 8. Separated fibrillæ, showing the beaded enlargements.

An ordinary muscle consists of bundles of fibres, arranged with great regularity in the direction of its action. Each individua fibre may be separated into fibrillæ by the splitting of its contents in a longi

tudina direction; these fibrillæ then present a banded appearance, caused by the arrangement of the contents of the tube.

In structure muscular tissue is divided into *striated* (*striped*) and *non-striated* (*unstriped*)—the former being mainly appropriated to the voluntary functions, and the latter to the organic or involuntary. Functionally muscles are divided into *voluntary* and *involuntary*. The former contract in obedience to the will, and are the instruments by which the mind acts on external objects. Their fibres are arranged in parallel lines, and are connected together by areolar substance. Those of involuntary motion are more simple in their structure and arrangement than those under the influence of the will. Their fibres are disposed in layers, generally transverse or diagonal, with distinct parallel lines continually interlacing. In this way they form circular rings around the cavities of the circulating vessels, as the arteries, veins, absorbents, excretory ducts, and hollow viscera, as the stomach, bowels, uterus, and bladder, constituting one of their coats or coverings, which, by contracting, diminishes the calibre or cavity in length and diameter; and thus their contents are moved forward or expelled. The muscular tissue is not reproduced when once destroyed, but the loss is supplied by areolar substance, which is wholly insensible.

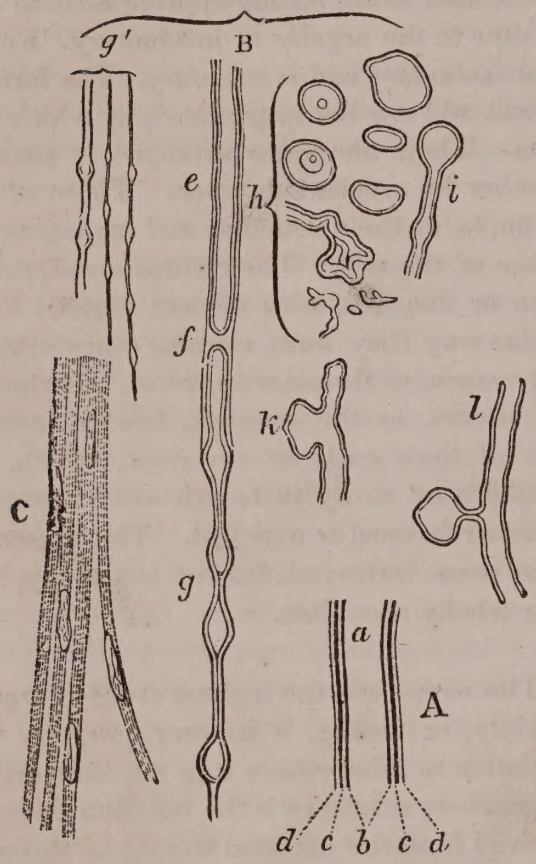
THE NERVOUS TISSUE.—The nervous is the highest order of organized matter. Though sensibility, or feeling, is its only property we can call vital, its immediate relation to mind causes it to manifest varied and wonderful powers. The nervous substance is the medium through which all impressions are received from the external world, and through which the mind conveys its mandates to the voluntary muscles. All motions, changes, or functional actions which are performed by the muscles, depend on the power, energy, or influence transmitted to the muscular tissue from the nerves.

The nervous structure is composed of a *white* or *fibrous* matter, which in the nervous trunks is tubular, with a secondary deposit within the cavity of the tube; and a *gray* or *vesicular* substance found in the ganglions. Wherever these two kinds of nervous matter are united together they constitute a *nervous centre*.

The ultimate nerve-fibre is tubular, consisting of an external thin and delicate membrane, which forms a sheath, and isolates the contained matter in its whole course from its central to its peripheral extremity. This has been called the *tubular membrane*, within which is contained a more opake substance, called the *white substance of Schwann*; and within this white substance is a transparent material, called the

axis cylinder. The whole of this contained substance is very soft, and may be made to move along in the cavity of the tube.

Fig 124.



TUBULAR FIBRE OF SPINAL NERVE.

Fig. 124 is a diagram of tubular fibre of a spinal nerve. *a*. Axis cylinder. *b*. Inner border of white substance. *c, c*. Outer border of white substance. *d, d*. Tubular membrane. B. Tubular fibres; *e*, in a natural state, showing the parts as in A. *f*. The white substance and axis cylinder interrupted by pressure, while the tubular membrane remains. *g*. The same with varicosities. *h*. Various appearances of the white substance and axis cylinder forced out of the tubular membrane by pressure. *i*. Broken end of tubular fibre, with the white substance closed over it. R. Lateral bulging of white substance and axis cylinder, from pressure. *l*. The same, more complete. *g*. Varicose fibres of various sizes, from the cerebellum. C. Gelatinous fibres from the solar plexus, treated with acetic acid, to exhibit their cell nuclei. B and C are magnified 320 diameters.

Physiologists are not agreed respecting the complete regeneration of nervous tissue after it has been once destroyed. Of its partial restoration there can be no doubt.

The nerve-fibres, which originate in the brain, and are distributed to the muscles, have no proper termination, but form *loops*, which either return into themselves or join others formed by the ultimate ramifications of the main trunks.

The *vesicular* matter, wherever found, is regarded as a *generator* of nervous influence; and the *white* or *tubular* as the *carrier* of that influence to the various parts of the system. The former portion is supplied with much the largest proportion of blood.

The general nervous system is susceptible of a division into five subordinate systems: 1. The nutritive system, or nerves of organic life. 2. The motory system, or nerves of voluntary motion. 3. The sentient system, or nerves of sensation. 4. The mental system, or brain. 5. The reflex system.

THE NUTRITIVE NERVOUS SYSTEM.—This system includes all the organic or involuntary nerves. In the order of development it precedes the others, as it relates to, and, in fact, presides over, all the processes of organic or vegetative life. All the functions belonging to the growth, development, and transformation of the bodily structures are controlled by these nerves. They have no sensibility of which the brain takes cognizance; yet they have an impressibility or a feeling of their own. To illustrate: the brain does not feel food in the stomach, nor blood in the heart, nor air in the lungs, nor bile in the liver, yet their presence is recognized or felt by the organic nerves. These nerves, too, have their little brains, or special centres, which serve to supply the nervo-electric influence to particular parts and organs, and connect the whole together in close sympathetic functional relations. The semilunar ganglion may be considered as the presiding centre, or great brain, and the other ganglia the central points, or little brains of the nutritive system.

In the lowest orders of animals the nutritive or organic system is concentered in a single straight nervous cord, which performs all the functions of those animals, as the brain, which belongs to a higher grade of being, does not exist. It is stated as a remarkable circumstance, that those animals which have no brain are also destitute of a spleen or melt. This fact strongly favors the hypothesis that the principal function of the spleen is to supply the organic nerves with an additional laboratory of their peculiar electrical or other power or influence. The organic nerves evidently derive their nourishment and support, as well as the principle or element by which they operate to control and regulate the organic functions, in a great measure directly from the arteries, for which purpose their filaments penetrate the arterial coats, and spread out on their internal surfaces. The superaddition of a brain in the higher animals seems to demand an additional source or organic nervous power, for the special purpose of its development and support. And for this purpose the spleen, by its large provision of arterial blood, and absence of an excretory duct, seems well adapted.

The organic nerves are connected with the cerebral by frequent anastomoses, which circumstance accounts for the reciprocal influence between mental impressions and bodily affections.

THE MOTORY NERVOUS SYSTEM.—All the nerves of voluntary motion originate from the brain and spinal marrow. In a perfectly healthy state of the whole organism, they are completely under the control of the will. In various spasmodic and convulsive diseases, this relation is for a time nearly or quite destroyed. The motor nerves are

distributed to every muscular fibre in the body, and are the instruments through which the mental impulse is communicated to the muscles. All voluntary action is the motion produced by the contraction of the muscular fibres in obedience to the volition or decision of the mind, conveyed to the muscles by the motory system of nerves.

The Sentient Nervous System.—The nerves of sensation like those of voluntary motion, are said to originate from the brain and spinal marrow. They are the instruments of communication from the external world to the brain, being the media of the external senses—seeing, hearing, tasting, smelling, and feeling. Thus the optic nerve conveys to the brain impressions of light; the auditory, of sound; the gustatory, of savors; the olfactory, of odors; and the nerves, of touch, distributed to all parts of the body which are endowed with sensibility, convey impressions of the chemical or mechanical properties of bodies, as heat, cold, form, size, density, pressure, etc.

Each nerve of a special sense is endowed with a modification of the general sense of feeling peculiar to and inherent in itself; for under no circumstances can the ear feel the impression of light, the eye of sound, or the skin of odors.

The Reflex Nervous System.—The spinal cord is regarded as a conveyer of nervous influence to and from the brain, and also as an originator of nervous influence. When the spinal cord is divided or severely injured, the motor nerves given off *below* the injured point do not respond to the volition transmitted from the brain, while all the nerves *above* that point are under the influence of the brain. The impressions on the sensitive nerves are not propagated to the sensorium from below, but are from above the injured point.

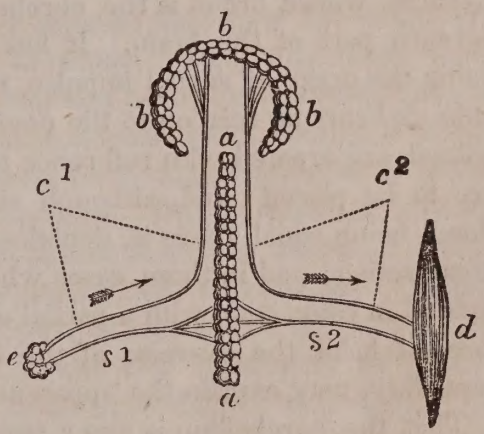
The spinal cord is divided into two lateral halves, and each of these into an anterior, middle, and posterior column, corresponding probably to the sensory, motor, and organic nerves. The anterior root of the spinal nerves is the motor or *efferent* root, which conveys impressions *from* the brain; the posterior is the sensory or *afferent* root, which conveys impressions *to* the brain. A part of the fibres of both roots are unconnected with the brain, having their origin in the gray matter of the spinal cord. These fibres are supposed to form a distinct nervous circle, and they constitute the system to which those actions are due, called *reflex*. All spasmodic or convulsive movements of the body are considered examples of extreme reflex action; the producing causes of them may be seated in the spinal cord itself, then called *centric irritation*, or at a distance, the irritation of which is transmitted to the

cord, called *concentric irritation*. *Reflex motions* are those muscular actions or contractions which take place in consequence of impressions conveyed *to* the spinal cord by the *afferent* nerves, and reflected *from* them by the *efferent* nerves.

A spinal nerve contains a bundle of *sensory* fibres passing upward *to* the brain; a *motor* set, conveying the influence of volition *from* the brain; an *excitor* set, or centripetal fibres, terminating in the true spinal cord, or ganglion, and conveying impressions *to* it; and a *motor* set, or centrifugal fibres, arising from the true spinal cord, and conveying the motor influence reflected from it to the muscles. The last two named sets of fibres, with the gray matter in the centre of the cord, constitute the reflex system.

Fig. 125 is a diagram of the origins and terminations of the different groups of nervous fibres. *a*, *a*. Vesicular substance of the spinal cord. *b*, *b*. Vesicular substance of the brain. *e*. Vesicular substance at the commencement of the afferent, which consists of *c* 1, the sensory nerve passing to the brain, and *s* 1, the spinal division, or excitor nerve, which terminates in the vesicular substance of the spinal cord. On the other side is the efferent or motor nerve, consisting of two divisions, *c* 2, the cerebral portion conveying voluntary motion, and *s* 2, the spinal division conveying reflex motion.

Fig. 125.



GROUPS OF NERVOUS FIBRES.

The medulla oblongata has the general properties of the spinal cord, and associates the cord and brain in functional qualities. Its power of reflexion is considered higher than that of any other part of the nervous system, irritation of it exciting convulsions in the whole trunk of the body. Respiration, deglutition, and those rhythmical actions of the respiratory system, laughing, yawning, sighing, etc., depend upon it. It is supposed also to be the seat, in whole or in part, of the power of voluntary motion.

THE MENTAL NERVOUS SYSTEM.—The surface of the brain is arranged in various convolutions, which constitute the phrenological organs of the prevailing system of mental philosophy. These convolutions bear a close relation to the general mental capacity, being more numerous and prominent in persons whose minds have been well-developed by exercise, while in those whose brains have been exercised but little they are much less complex, and in idiots exceedingly

limited. The object of these convolutions is to afford an extensive surface for the gray or vesicular matter which generates the nervous power, and a more free communication between the blood-vessels on one side, which supply the materials of nervous influence, and the numerous fibres on the other side, which propagate their influence to the muscles.

The brain and spinal cord are divided by a mesial line into equal right and left halves or hemispheres; hence all the mental organs are double, as are also the sentient and motor nerves, which convey impressions to and from them.

All physiologists agree that the cerebrum is the seat of intelligence This part of the brain composes about six sevenths of the whole encephalon, and usually weighs from thirty-six to forty-six ounces. Phrenologians regard it as the seat of all the mental powers, except amativeness, whose organ is the cerebellum, which constitutes about one seventh part of the brain. It has been objected to the cerebellum being the organ of sexual impulse, that its development in the scale of animals bears no relation to the energy of the sexual propensity. But animals are created with reference to the circumstances in which they are to be placed; and, although size is a measure of power, other things being equal, there is, doubtless, as much in *quality* as in *bulk* of organization; and in those cases where the passion of amativeness has existed in connection with a partial or total absence of the organ—the force of habit, the exercise of the organ, or transmitted organic susceptibility, may explain the apparent exceptions to general experience.

That the cerebellum is also a generator of nervous influence to the muscles of locomotion, seems to be established from experiments on animals. When the organ was removed, although sensibility in any part was never destroyed, the animals lost the power of standing, walking, springing, flying, etc.

The whole brain, though the seat of sensibility, is itself wholly insensible. Any part of it may be cut, pricked, torn, or removed, without exciting pain.

Animals from whom the cerebrum was removed always lost the senses of sight, hearing, taste, and smell, and appeared as if in a deep sleep, without the power of dreaming; they could, however, be aroused to *unconscious* motions by irritations operating through the sense of feeling. These facts prove that it is not only the seat of most of the mental functions, but possesses the power of directing the mind to particular sensorial impressions.

PHILOSOPHY OF MIND.—The brain is the presiding centre of sensa

tion, voluntary motion, the intellectua faculties, and the passions or propensities. The mind is the aggregate of all the functions of the brain. A mental power is the function of a particular organ or portion of the brain. All the mental powers may be distinguished into faculties and propensities.

The faculties together constitute the intellect. They are the powers concerned in thought, the formation of ideas, the acquisition of knowledge, the thinking and knowing part of the mind. The faculties are divided into perceptive and reflective. The perceptives take cognizance of individual things and their mechanical properties. The reflectives arrange, compare, and analyze subjects, and trace out their relations of cause and effect. The perceptive faculties are the functions of the observing organs; the reflective faculties are the powers of the reasoning organs.

The propensities are the feeling organs; they are the impulses, emotions, or passions which impel to action. To gratify these feelings or propensities the intellectual faculties devise means, seek out objects, study methods. The external or special senses, seeing, hearing, smelling, tasting, and feeling, are the media through which the faculties operate in their natural or normal condition. But they are capable of acting independently of the external senses in certain abnormal states, as in somnambulism, dreaming, mesmerism, and clairvoyance. When the faculties have discerned the object, or ascertained the manner of satisfying the impulse or propensity, the will determines its instrumentalities—the bodily structures, to act in relation to its possession or enjoyment. The propensities which relate merely to individual preservation are called selfish, or self-relative; those which pertain to the family circle, domestic; those which connect us in mutual interests and sympathetic relations with our fellow-creatures, social; the higher plane of propensities, which relate to rules of action, conscience, and a Supreme Being, are termed moral qualities or sentiments; and those propensities most nearly allied in location and association with the faculties are called semi-intellectual.

Mind then appears to us as "duality in unity," consisting essentially of faculties and feelings—in other words, affections and thoughts. It is not difficult to imagine that the affectuous mind is the primitive mental property; first in order, highest or most interior in existence, and, to extend the idea poetically, more nearly

"allied
To angels on our better side."

All *true happiness* consists in *right feeling*; thinking is but a means

to it. The healthful exercise of all the mental powers is the perfect condition of right feeling; and the normal play of all the bodily functions is indispensable to this healthful exercise of the mental powers. It is, therefore, literally true that health of body and health of mind is happiness.

The mind, however, must not be confounded with the soul. Mind may be defined as the manifestation of the soul or spirit through the material organism.

The Nervous Influence.—The essential nature of that power, principle, or influence, which endows the nervous tissue with its peculiar properties has always been a theme of interesting speculation. The most ancient doctrine was that of the circulation of a fluid through the tubes of the nervous fibres; but at length the tubes were found not to be hollow. The next theory was that of vibration: it was supposed that the nerves conveyed impressions from one extremity to the other by a vibratory motion analogous to a stringed instrument; but this doctrine was abandoned on discovering that the nerves, instead of being attached firmly at their extremities, are diffused into a soft, pulpy mass. The prevalent opinion now is, that the source of nervous power is some modification of electricity. The identity, however, of the nervous influence with electricity, galvanism, or magnetism, as manifested by any structure or material other than the nervous tissue, is positively disproved. It has been ascertained that if a ligature be placed upon a nerve, its power of conducting the true nervous or functional influence is lost, while its ability to transmit electrical currents remains.

In the present state of physiological science, therefore, we can only say that the nervous influence, the sensibility of the nervous tissue, the contractility of the muscular, and the elasticity of the areolar, are each vital properties peculiar to, and developed in, the organization of the structures to which they appertain; and there is not much probability that we shall ever arrive at any better explanation. What they are exactly and essentially we can no more demonstrate than we can the essential nature of oxygen, electricity, magnetism, or any other elementary substance or principle; nor would we be benefited if we could

Rationale of Muscular Action.—The voluntary muscles are disposed in sets, which are said to antagonize each other; these sets are called flexors, extensors, adductors, abductors, etc., as they draw the part to which they are attached forward, backward, inward, outward, etc. Thus, where the flexors contract they close the fingers,

draw up the arms, bend the legs, etc.; and the extensors, by contracting, open the fingers, extend the arm, straighten the leg, etc. The common opinion has long been, that when the nervous energy, or influence of the brain, is transmitted to one set of muscular fibres—the flexors, for example—they contract, while the other, or antagonizing muscles, remain passive, by which flexion is produced; and that when the nervous influence is directed to the opposing, or extensor muscles, these contract, and the flexors remain passive, by which means the contrary motion, extension, results.

But such cannot be the correct theory of muscular motion. Experiments seem to have demonstrated that when the nerves which supply either the flexor or extensor muscles are divided, neither will act or contract at all. From this it appears that neither set can act independently, and that the antagonizing muscles, as they are called, do really act in correspondence; the same nervous influence which produces contraction in one set, producing relaxation or expansion in the other. We must, then, regard muscular action, which is performed by the alternate contraction and expansion of the muscular fibres—analogous to electrical attraction and repulsion in inorganic matter—not as depending on two principles of influence, or on one principle alternately bestowed and withdrawn, but as resulting from two properties of one principle operating simultaneously.

The same law of motions appears to prevail with regard to the involuntary muscles; but their structure and arrangement are so different that its operation is more difficultly traced. Instead of running in straight lines, their fibres extend in parallel, transverse, diagonal, and circular directions, thereby embracing the part, organ, or vessel, so as to produce a complicated series of motions at the same time, as in the stomach, bowels, bladder, and uterus, where a kind of universal compression on the contents of their cavities results from the varied directions and motions of their fibres.

The strength and rapidity of muscular action are well illustrated in the feats performed by tumblers, jugglers, and dancers, and the articulations of spoken language. Some persons can pronounce 1500 letters in a minute, each requiring a separate contraction of muscular fibres, followed by a relaxation of equal length; so that each contraction must have occurred in one tenth of a second.

Mesmeric Phenomena.—Those manifestations of peculiar abnormal states and operations of the mental nervous system, known as dreams, somnambulism, second sight, mesmerism, clairvoyance, etc., deserve a passing notice. The sum total of these phenomena has been called

mesmerism, pathetism, electrical psychology, or electro-biology, etc. The fact that the mind can and does take cognizance of things—sometimes real and sometimes imaginary—while in the state or condition termed mesmeric, which it cannot and does not in its ordinary state or condition, is unquestionable. The explanation is not so apparent.

It is a self-evident proposition that the human mind is created with constitutional relations to all objects in external nature—in the universe. All surrounding objects, without regard to direction or distance, may and do hold a specific relation to the mind, in other words, act upon, or impress, or hold communication with it. The special senses—seeing, hearing, tasting, smelling, and feeling—are the media of the correspondence between mind and surrounding objects, in the usual, ordinary, or normal state. But if the brain and nervous system are functionally exalted, rendered peculiarly impressible, while the special senses are in the ordinary functional condition, the mind will have a larger field of perceptions, a greater capacity to form ideas, whether correctly or incorrectly. If the brain and nervous system maintain, by any unusual internal or external exciting cause, the normally active condition, while the external or special senses are at rest—inactive or insusceptible—the same increased mental capacity to feel the impressions of distant objects, form ideas, etc., results. And if the brain and nervous system are under the abnormal influence which preternaturally augments their functions, while the external senses are not merely in a state of normal repose, but of profound and preternatural rest—abnormally insusceptible—then the objects at a very great distance, or in a direction which could not be seen, felt, heard, etc., in the normal state, or through the external senses, impress the mind, and are distinctly recognized. In this state, too, the mind takes greater or less cognizance of the thoughts of other minds with which it is brought into close sympathetic relations, and echoes very accurately the thoughts or opinions of such minds. In this way clairvoyants answer with surprising correctness many questions, their answers being simply the reflection of the minds, thoughts, or opinions of the operator, or manipulator, or of the person placed in communication.

But many times the attention of the mesmerizee or clairvoyant is directed to places, objects, and persons at great distances, hundreds or thousands of miles, when they discover and describe many things as they really exist, and others which have no reality at all. These phenomena prove that the mental field of vision may be vastly extended, but that its abnormal or preternatural state does not render its impressions reliable as exclusive sources of information; the ever-varying states of the nervous susceptibility may render the cognizance of

objects in the abnormal state just as variable in regard to reality or fantasy.

Some persons have an organization peculiarly favorable to the manifestation of the phenomena in question, and others are capable of acquiring a great degree of mesmeric susceptibility, so much so as to pass into the clairvoyant state at will, and then survey with interior vision many things in heaven and earth as they really exist, or revel in dream-land, as imagination leads off in the mental operations.

The phenomena more strictly physiological, and those effects on the nervous influence which have been made available as remedial processes in disease, may all be accounted for on the principles of mental sympathy and electrical or magnetic innervation. A strongly magnetic, powerfully electric, or in other words, vigorously healthy person, may rapidly manufacture nervous influence, and readily impart it to another of more susceptible temperament, or in feeble health. The hand and fingers are exquisitely organized for receiving and transmitting a large amount of nervous influence, and gentle manipulations are the best ways of imparting it. The exercise of weak, torpid, and rigid muscles, by rubbing, kneading, thumping, etc., is remedial, or innervating, or magnetically medicinal, very much in the ratio of the capacity of the vital organism, and the development of the organic or nutritive nerves and ganglia of the operator.

Order of Structural Development.—From minute vesicles or cells, having as a nucleus a small round body of matter, surrounded by a granular fluid, and enclosed in a thin membrane, all the structures are developed. The ovum and the embryo are originally composed of such nucleated cells. Some cells are independent of and isolated from each other, as the corpuscles of the blood, chyle, and lymph; others cohere by their surfaces and borders, as in the epidermis, or scarf-skin; others are connected by an intermediate substance, as bone and cartilage; and others are united in rows, forming hollow tubes, capillary vessels, and the tubuli of nerves and muscles.

The first distinct structure developed in the human body is that of the nerves of organic life. The necessity of this is apparent, as they constitute the presiding centre and controlling instruments over all the functions of nutrition and growth. They form not only a general centre to the whole organic system, but by means of their ganglia supply each particular part organ, and function with a special presiding centre. These ganglia appear like mere enlargements of the nervous cord, and are numerously distributed throughout the body, according to the importance and complexity of the functions to which they specially

appertain. They serve undoubtedly to collect, direct, modify, regulate, and adapt the nervous influence to the functional condition of the various organs, and constitute, in one sense, so many points of polarity to its attractive and repellent properties.

Next in order, as second in functional importance, the heart and muscular system are produced, followed by blood-vessels gradually extending and enlarging till the vascular system is completed. The nutritive or organic nerves intimately accompany the arteries from their ganglia, and send off branches to aid in the development and preside over the nourishment of particular organs, to which they hold the same relation that the brain does to the voluntary muscles. The ganglia which form the subordinate centres to the alimentary canal are the first ones produced from the increasing development of the organic nerves. Soon on each side of the central mass of the nutritive nervous substance numerous ganglia, or *little brains*, arise, in the shape of two connected nervous cords, and eventually form, on each side of the spinal column, a series of ganglia extending the whole length of the spine. These ganglia send out branches of nerves to the several special centres, to unite them in associated action; to the muscles, and to those branches of the other ganglia which are sent to the viscera, and contribute to the development of the spine, trunk, and extremities.

The great centre of the organic system, the semilunar ganglion, consists of the two semicircular bodies behind the pit of the stomach; they are closely connected by branches passing from one to the other, which form the solar plexus. To this general centre the numerous special centres are united by nervous cords and plexuses. Death takes place if the functions of this system of nerves be suspended but for a moment.

With the increasing formation of the ganglionic centre the alimentary organs are developed; the stomach, intestines, pancreas, etc., followed by the excretory organs, the liver, kidneys, and skin. Lastly are developed the lungs, spleen, brain, and spinal marrow, the membranes, bones, ligaments, and cartilages, terminating in the hair, nails, and epidermis.

CHAPTER II.

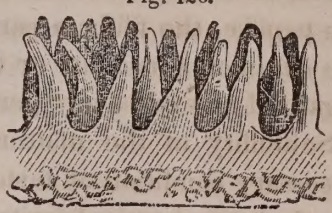
OF THE SPECIAL SENSES.

SENSATION is the recognition by the mind of an impression. That part of the brain, or rather quality, which perceives impressions is often

called the *sensorium*. Sensations are distinguished into *external* and *internal*. External sensations arise from impressions made upon the outer surface of the body, as the eye, nose, mouth, ear, and skin, which are the organs of the external or special senses. Internal sensations have their causes within the body, and arise from functional conditions, as hunger, thirst, suffocation. An active capillary circulation is essential to the normal sensibility of a part. If the blood is excluded from the capillary vessels by severe cold, the sensibility is deadened; and if the vessels are over-distended, as in inflammation, the sensibility becomes painful. General sensibility is distributed over the entire body, enabling us to feel those impressions of surrounding objects which produce the various modifications of pain and pleasure. Special sensibility pertains to those organs which connect the mind with the physical world, and by which the mind is educated. The nerves of special sensation have no general sensibility except what is derived from nerves of general sensibility distributed to them.

Sense of Touch.—The nerves of feeling are the posterior roots of the spinal nerves, and some fibres of the fifth and eighth pairs of cerebral nerves. They are distributed to the papillæ of the skin, which are small elevations enclosing loops of blood-vessels and branches of sensory nerves, situated on the external surface of the cutis vera.

Fig. 126.



CUTANEOUS PAPILLÆ.

Fig. 126 is a representation of the papillæ of the palm of the hand, the cuticle being removed.

When a body to be touched comes in contact with the sensory surface, the only idea communicated to the mind is that of resistance. The degree of resistance affords a knowledge of the hardness or softness of the body. When the body touched and the sensory surface are moved upon each other, a motion is conceived of extension or space, roughness, smoothness, and other mechanical properties.

The knowledge of *form* and *weight* some late physiologists have been unable to account for by the ordinary sense of touch, and have got out of the difficulty by supposing a sixth sense, which they call the *muscular sense*, to exist for that particular purpose. The sense of *temperature* has also been attributed to a distinct set of nerves, because the recognition of it occurred without the actual contact of the hot or cold body with the sensory surface. I do not see that either supposition makes the matter any clearer. Form and weight are but degrees of extension and resistance, and temperature, whether its essential nature

is caloric, light, or electricity, is but the perception of rays or particles coming in contact with the sensory surface, and expanding or contracting, that is to say, *moving* the contractile tissues so as to *impress* the nervous papillæ.

The sense of touch is developed in different parts in proportion to the supply of sensory nerves. In man the acuteness of the sense varies in different regions of the body. The lips, tip of the tongue, and inside of the last joints of the fingers are exquisitely sensitive, in consequence of the nerves being very numerous and superficially distributed. The epidermis is also very thin in those parts, and the innumerable lines and furrows afford the papillæ a greater degree of isolation. The development of the sense corresponds with the number and extent of these lines and furrows. The sense of touch, like all the special senses, may be educated to a surprising degree of acuteness and accuracy, as with the blind, who have been taught to read and even distinguish colors by it.

Sense of Taste.—The various papillæ on the surface of the tongue, when excited by contact with savory substances become turgid and erect, so as to produce considerable roughness of the organ. Some of the papillæ, the filiform particularly, are supposed to be concerned in the common sensibility or feeling of the tongue, and the remainder are regarded as exclusively pertaining to the sense of taste.

Solubility of the matter brought in contact with the tongue is a necessary condition of taste. The sense may also be excited by mechanical or chemical irritation of the nerves. A smart blow by the finger, or a galvanic shock, will often excite the taste, which is then sometimes acid and sometimes alkaline. As sapid substances impress the olfactory as well as the gustatory nerves, the sense of taste is gen erally materially diminished when the nose is obstructed.

Taste, like all the special senses, is highly educable, but in civilized life is generally deeply depraved and perverted. Its object in the animal economy is to direct us in the selection of alimentary substances, and assists us in judging of their adaptation to the wants of the nutritive apparatus. The ability to appreciate and enjoy the gustatory property of *natural* and *healthful* food is exactly proportioned to the integrity of the sense; and those persons who cannot realize any agreeable savor in any article of nutriment until the papillæ of the tongue are stung into action by salt, pepper, mustard, vinegar, or other pungents, know but little of the bountiful and luxurious repast nature has provided for her unsophisticated children, or of the real pleasures of eating. Like the drunkard, who swallows the burning poison of alcohol

not for the mere pleasure of drinking, but to drown or appease a maddening and insatiable craving, the epicure or riotous liver eats not to enjoy or live, so much as to silence the goadings of a morbid appetite.

Sense of Smell.—Olfaction enables us to distinguish flavor, and thereby judge of the odorous particles floating in the atmosphere. Its use is to co-operate with taste in determining the qualities of food, and protect the respiratory passages by detecting injurious effluvia or other deleterious matters. Its seat is the mucous membrane of the nose, though the whole of the mucous surface is not endowed with the sense of smell. The upper portion of the membrane, expanded over the superior and part of the middle spongy bones, is the olfactory region, to which the olfactory nerve is distributed. Sneezing, which is called a reflex action, is supposed to depend on the fifth pair of nerves, from which is derived the general sensibility of the mucous membrane.

The conditions requisite for the perfect exercise of this sense are, integrity of the nervous apparatus, and a normal degree of special sensibility. The odorous particles must also be soluble. Colds, inflammation of the mucous surface, strong irritants and narcotics, as cephalic or tobacco snuff, always weaken or paralyze, and sometimes utterly destroy all perception of odors. Smelling-bottles of ammonia and camphor, and all strong and pungent perfumery, not only injure the sense, but injuriously affect the whole brain through the medium of this sense.

Sense of Hearing.—No part of the human organization exhibits a greater complexity of structure than the hearing apparatus. Nor will it excite wonder that it is so, when we consider how extensively human beings are related to the external world and to each other, in their duties, their interests, and their pleasures, by this function. The *external ear* is fashioned into various elevations, depressions, and curvatures, peculiarly fitted to catch the sonorous waves from all directions. The *external meatus* conveys them, strengthened by reflection from the walls of the canal, and modified by the resonance of the mass it encloses, to the *membrana tympani*. This membrane is not essential to sound, for its perforation or destruction is not followed by a loss of the sense, but it serves to modify the sonorous vibrations which are to be communicated to the chain of bones, in such a manner as to be thrown into reciprocal vibration, though it cannot reciprocate any sound lower than its own fundamental note.

The *chain of bones*, moved by their muscles, conducts the vibrations across the tympanum to the *internal ear*. The *tensor tympani*, in the

function of hearing, performs an office analogous to that of the iris in seeing. Its contraction draws down the handle of the malleus, rendering the membrana tympani tense. When very tense it cannot reciprocate *low* sounds, and by *very loud* sounds it may be excited to reflection, in which state the membrane is too tense to reciprocate them. Its natural condition is rather lax, the state in which it can reciprocate the greatest variety of sounds. The tensor tympani muscle contracts more powerfully as the sound is louder, as the iris does upon the application of the stimulus of light.

The *tympanum* isolates the chain of bones, and allows free motion to the membrane at each of its extremities, while its contained air reverberates the sound, which is still further strengthened and modified by reflection from the neighboring walls, cells, spaces, and cavities, particularly by the reflection from the membrane of the *fenestra ovalis* and *fenestra rotunda*. The *Eustachian tube* serves principally to maintain an equilibrium between the external air and that enclosed in the tympanum, by which undue tension of the membrana tympani is prevented.

The uses of the different parts of the labyrinth are not well understood. It is supposed that the *semicircular canals* regulate the perception of the *direction* of sounds, while the *cochlea* determines the *pitch* of the notes. The *fluid* contained in the *membranous portion* of the labyrinth, and the ear-stones, *otoconites*, which float in it, doubtless increase the impression on the sentient nerves by being thrown into vibratory motions, while this part of the labyrinth itself affords a more extended surface for the expansion of the auditory nerve.

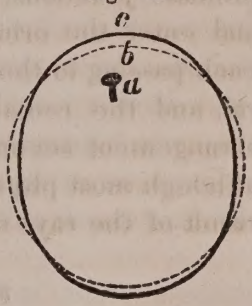
Philosophy of Sound.—The whole complex structure of the auditory apparatus has reference to two principles: the propagation of sonorous vibrations, and their multiplication by resonance. In some of the lower animals the perception of sound takes place by means of a very simple contrivance, consisting essentially of a sac containing a fluid, and having a nerve spread out upon it; the membrana tympani, ossicula, cochlea, and semicircular canals being absent.

Sounds are said to be propagated by *reciprocation*, by *resonance*, and by *conduction*. An example of the first method is found in two strings of equal tension, placed side by side; if the one be thrown into vibration, the other will reciprocate by making corresponding vibrations. Resonance occurs when a sounding body is placed in connection with any other, of which one or more parts may be thrown into reciprocal vibrations, although the tone of the whole be different, or if the medium be incapable of producing any tone at all. Thus, if a tuning-fork, while vibrating, be placed in contact with a sounding-board the latter will di-

vide itself, as it were, into a number of parts, each of which will reciprocate the original sound so as greatly to increase its intensity. Sounds of conduction are propagated through all bodies, solids being better conductors than fluids, and fluids more conductive than gases. If the ear be placed at one extremity of a log or a long board, and the other end be struck, the sound will extend along or through the whole length of the material, and be perceived by the organ.

A more definite idea of sound may be obtained from the familiar illustration of the common church bell.

Fig. 127.



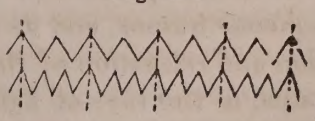
When the tongue, *a*, strikes the side at *b*, it springs out to *c*, changing entirely the form of the bell, which is represented by the dotted line. When the bell springs back to its original form, its sides retract and expand in an opposite direction, as a vibrating string rebounds beyond its centre, or starting point; and so alternately, making a succession of sonorous waves of air, as a stone thrown into a pool causes circular rings to expand in all directions. When these movements of the air become sensible to the ear, we have the perception of sound.

The primitive sounds of the musical scale are derived from the different forces or kinds of vibration. Thus, when a bell is struck, the first full, loud sound is the fundamental or key note. When the force of the blow is partially spent, there is a different degree of motion, producing a different force of atmospheric vibration, and occasioning a modified perception of sound; and when the vibrations have decreased still further in intensity, a third primitive sound is recognized.

A musical *chord* is the combined sound of several sounds produced simultaneously. When the effort is pleasant to the ear, these chords are called *concords;* and when unpleasant, *discords*. The most pleasing concords are produced when the greatest number of vibrations in a given time occur together; and the most disagreeable discords, when the fewest vibrations take place simultaneously.

A good idea of concord may be gathered from the following illustration:

Fig. 128.



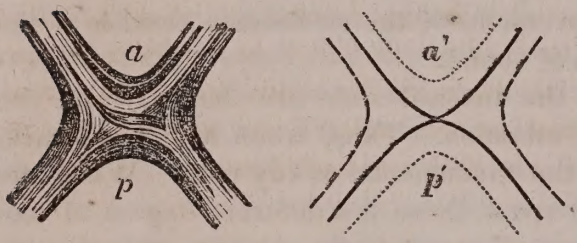
On counting the waved lines, it will be found that every third vibration of the sound represented by the upper line, and every second vibration of the sound represented by the under line, come together, the conjunction being denoted by the dotted cross-lines. According to the greater or

less frequency of these coincident vibrations, are the sounds concordant or discordant. The most agreeable concord is, of course, that where every vibration of one sound and every other vibration of another sound come together.

THE SENSE OF SIGHT.—Vision makes us acquainted with the existence of light, by which medium the mind recognizes the form, size, color, position, etc., of bodies that transmit or reflect it.

The roots of the optic nerves unite, before entering the orbits, into intimate junctions, called *chiasms*, from these chiasms they diverge and enter the orbit through the optic foramina, part of the fibres of each passing to the opposite eye, a part being connecting or commisural, and the remainder passing to the eye of the same side. This arrangement seems to associate the two eyes in a single act of vision, although most physiologists regard the single vision with two eyes as a result of the rays of light from a luminous object falling upon parts of the retinæ accustomed to act together.

Fig. 129.



OPTIC CHIASM.

Fig. 129 is a representation of the course of the fibres of the optic nerve in the chiasm. *a.* Anterior fibres, commisural between the two retinæ. *p.* Posterior fibres, commisural between the thalami, or origin of the optic nerves. *a.' p.'* Diagram of the preceding.

The essential parts of the eye are, the expansion of the optic nerve, called *retina*, which *feels* the impressions of light, and the *transparent refracting media*, or humors of the eye, which transmit the light so as to bring it to a focus upon the retina. The *sclerotic* forms a firm support to the globe, and is opake, except in front, where it becomes transparent for the admission of the rays of light, and is called *cornea*. The dark pigment called *choroid*, between the sclerotic and retina, absorbs the rays of light after they have impressed the retina. The choroid becomes gradually lighter in many people as they advance in life, and in the Albino it is entirely wanting. The *iris* is a vertical curtain-like process of the choroid, hanging across the cavity of the aqueous humor, and its central perforation is the *pupil*. The contraction and relaxation of the circular fibres surrounding the orifice of the pupil, as the rays of light are stronger or weaker, regulate the impression on the nervous expansion. When the iris becomes insensible or weakened, the pupil remains permanently dilated and vision dull, as

in affections of the optic nerve, compression of the brain, etc. The iris is also weakened and the pupil dilated by being continued too long in dark or deeply shaded situations. The pure narcotics, belladona, henbane, etc., cause a dilatation of the pupil by paralyzing the nervous influence. Under exposure to very strong light, and in acute inflammatory affections of the brain, the pupil is remarkably contracted; and also during the stage of excitement, when the brain is laboring under the influence of the stimulating narcotics, as opium, camphor, and alcohol.

The adaptation of the eye to distances is a phenomenon not yet very well explained. Some physiologists consider it as entirely the result of habit or education, while others suppose the perception of a distinct image, whether the object be far or near, is owing to an altered position of the crystalline lens by muscular agency—an opinion strengthened by the fact, that the adjusting power of the eye is impaired or lost by the extraction of the lens, or by paralyzing the muscles of the ciliary processes and iris with belladona.

The question has been much discussed, why objects appear erect to us, when it is known that the rays of light from the opposite points of a luminous object cross one another by the successive refractions they experience, and thus make the image on the retina actually inverted? But no satisfactory solution has yet been offered, and many regard the phenomenon as the result of education and experience.

CHAPTER III.

OF VOICE AND SPEECH.

Voice is formed in the larynx, and is produced by the simple expulsion of air from the lungs, when the vocal ligaments or cords are held in a certain degree of tension. Nearly all animals possess the power of making voice-sounds. Singing, crying, and yelling are examples. *Speech* is the modification of voice-sounds in the cavity of the mouth, constituting articulation. The articulating organs are the tongue, palate, lips, and teeth. The fauces and cavities of the nose modify and intensify both voice and articulate sounds by affording a resonant surface. Speech in perfection is a faculty peculiarly human, although many animals—the parrot and jackdaw, for examples—are capable of uttering words and sentences very distinctly.

All the *vowels* are voice-sounds, being made without any change in the shape or position of the vocal organs during their continuance. *Short* vowel sounds are distinguished from those termed *long*, *broad*, *grave*, and *close*, by the impossibility of prolonging them for any appreciable length of time. The others can be prolonged as long as expiration can be maintained. The *consonants* are articulate sounds, formed by interruptions in the vowel sounds produced by changes in the position of the vocal organs.

The English language may be reduced by analysis to forty-four rudimental sounds, or elements, sixteen of which are vowels and twenty-eight consonants. The vowel elements are: the *long*, *short*, *broad*, and *grave* sounds of *a*, as in *ail*, *at*, *all*, *ah*; the *long* and *short* sounds of *e*, as in *ease*, *end*; the *long* and *short* sounds of *i*, as in *isle*, *ill*; the *long*, *short*, and *close* sounds of *o*, as in *old*, *on*, *move*; the *long*, *short*, and *broad* sounds of *u*, as in *turn*, *tub*, *full*; and the *double vowel* sounds of *oi* or *oy*, in *oil*, *coy*, and *ou* or *ow*, in *our*, *how*.

Diphthongs are two vowel sounds in one syllable; the only ones in our language are long *i*, as in *mile*, and long *u*, as in *lure*, and the sounds of *oi* or *oy*, and *ou* or *ow*. Triphthongs have no existence. They are said to be the union of *three* vowel sounds in one syllable; but though these vowels are often *written* in one syllable, one or more of them is always silent in the pronunciation, as in ad*ieu*, which is pronounced as if written ad*u*.

The consonant elements are: the *name* sound of *b*, as in *bite*; the *soft* or *hissing* sound of *c*, or name sound of *s*, as in *cent*; the *hard* sound of *c*, or name sound of *k*, as in *came*; the *name* sound of *z*, as in *suffice*; the sound of *sh*, as in *ocean*; the *name* sound of *d*, as in *dust*; the *name* sound of *t*, as in *correct*; the *name* sound of *f*, as in *brief*; the *name* sound of *v*, as in *of*; the *soft* sound of *g*, or name sound of *j*, as in *germ*; the *hard* or guttural sound of *g*, as in *gull*; the sound of *g* represented by *zh*, as in *rouge*; the *aspirate* or name sound of *h*, as in *hale*; the name sound of *l*, as in *late*; the *name* sound of *m*, as in *man*; the *name* sound of *n*, as in *nun*; the sound of *n* represented by *ng*, as in *link*; the *name* sound of *p*, as in *page*; the *smooth* sound of r, as in *far*; the *trilled* sound of *r*, as in *rough*; the *name* sound of *w*, as in *wool*; the sound of *x*, represented by *ks*, as in *flax*; the sound of *x*, represented by *gz*, as in *exist*; the sound of *y*, represented by *ye*, as in *youth*; the *aspirate* sound of *th*, as in *thin*; the *vocal* sound of *th*, as in *this*; the sound of *wh*, as in *whale*; and the sound of *ch*, as in *church*.

In a strictly philosophically written language, each distinct elementary sound should be represented by a distinct character, making as many

letters as there are vocal and articulate elements. But in the English language there are only twenty-six letters to nearly twice as many sounds; and while some of the letters represent but one elementary sound, others, as *a* and *c*, represent four. The phonographic reform, therefore, is clearly founded in nature and in physiology.

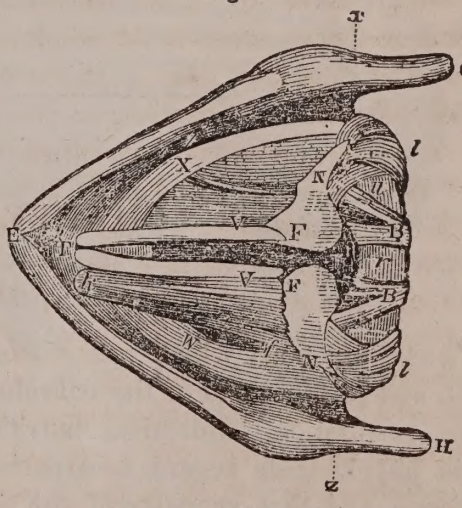
The vocal apparatus has been compared to various musical instruments, in which strings, tubes, and reeds are the agencies in the production of sound, as the violin, flute, and clarionet. The analogy is not very close in relation to either separately, but the vocal machinery combines many properties of them all.

The lower vocal cords are mainly concerned in the production of sound; if the upper cords are removed voice continues, but is rendered feeble; if the lower are destroyed, it is entirely lost.

The *tones* of voice depend on the varying tension of the vocal cords. In the production of tones, the ligaments of opposite sides are brought into approaching parallelism with each other by the approximation of the points of the arytenoid cartilages; in the intervals they are again separated, and the opening between them, *rima glottidis*, assumes the form of the letter V.

Fig. 130 exhibits the vocal ligaments as seen superiorly. G, E, H. Thyroid cartilage. N, F. Arytenoid cartilages. S, V, S, V. Vocal cords or ligaments. N, X. Crico-arytenoideus lateralis. V. k, f. Right thyro-arytenoideus. N, l, N, l. Crico-arytenoidei postici. B. B. Crico-arytenoid ligament.

Fig. 130.



LARYNX FROM ABOVE.

The muscles which stretch or relax the vocal ligaments are alone concerned in the voice. The muscles which open and close the glottis regulate the amount of the air inspired and expired, and belong to respiration. These muscles are the seat of spasmodic affections producing suffocation.

The *pitch* of the tones is regulated by the tension of the vocal cords. Its *volume* or *intensity* depends on the capacity of the lungs, length of the trachea, and the force with which the air is expelled, and the flexibility of the vocal cords. In the male the vocal cords are longer than in the female, in the proportion of three to two, which renders the male voice usually an octave lower

The natural compass of voice in most persons is two octaves, or twenty-four semitones. Singers are capable of producing ten distinct intervals between each semitone, making in all 240 intervals, requiring as many different states of tension of the vocal cords, all of which are producible at pleasure, and without a greater variation of the length of the cords than one fifth of an inch. One of the most wonderful phenomena of vitality is the facility with which the will determines the exact degree of tension necessary to produce a given note, when the mind has formed a distinct conception of the tone required.

A musical note is a prolonged vowel sound, and may be regarded as the natural language of emotion, or the expression of the affectuous mind. Speech is the natural expression of ideas or thoughts. These two kinds of natural language are intimately associated in the human being, so that there is music in *well-spoken* thoughts.

Ventriloquism is simply the power of imitating the voices of others, the cries of animals, and the sounds of inanimate matter so closely as to produce a complete vocal illusion, making them seem to come from any distance or direction, or through any kind of media. Those who have this imitative power well developed, must possess an extraordinary flexibility of the whole vocal apparatus.

CHAPTER IV.

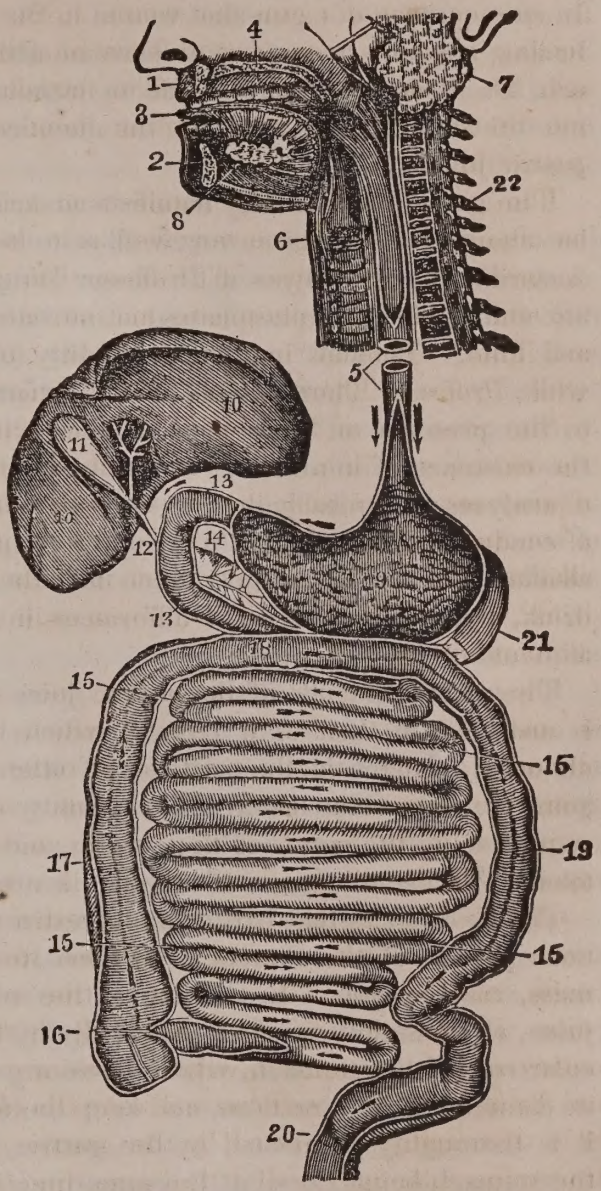
OF THE INDIVIDUAL FUNCTIONS.

Those functions which relate exclusively to the growth, development, and preservation of the individual organism are, digestion, circulation, respiration, absorption, nutrition, secretion, and calorification. Some physiologists regard *innervation*, or the production of nervous influence, and that property of the tissues called *endosmose* and *exosmose*, by which fluids and gases are interchanged through the structures, as distinct functions.

I think, however, the term function is not properly applied to those properties or processes of the organism. Innervation literally means the *existence* of nervous power; its production must depend on the other functions. Endosmosis and exosmosis are rather mechanical than vital processes, as they take place in unorganized as well as organized structures.

Fig. 131 is an ideal representation of the organs of digestion, opened nearly the whole length. 1. Upper jaw. 2. Lower jaw. 3. Tongue. 4. Roof of the mouth. 5. Œsophagus. 6. Trachea. 7 and 8. The parotid and sublinguinal glands—two of the salivary glands. 9. Stomach. 10, 10. Liver. 11. Gall-cyst. 12. The duct conveying the bile to the duodenum (13, 13) 14. Pancreas. 15, 15. 15, 15. Small intestine. 16. Opening of the small into the large intestine. 17, 18, 19, 20. Large intestine. 21. Spleen. 22. Upper part of the spinal column.

Fig 131.



THE DIGESTIVE SYSTEM.

DIGESTION.—The first of the organic functions is the conversion of alimentary matter into chyle, which in its turn is converted into blood. The first process of the digestive function is *mastication*, by which the food is divided into fine particles by the cutting and grinding action of the teeth. The presence of aliment and the act of mastication excite the function of the salivary glands to secrete the solvent fluid called *saliva*, which is intimately mingled with the particles of alimentary matter, completing the process of *insalivation*. The alimentary substances, comminuted and softened are then conveyed into the stomach by the act of swallowing, called *deglutition*. The presence of food in the stomach excites the flow of *gastric juice*, which is secreted from its mucous membrane. The vessels of the stomach then receive a greater supply of blood, and there is a slight increase of temperature. The solvent property of the gastric juice was generally conjectured, but sometimes denied, until

clearly demonstrated by the experiments of Dr. Beaumont, in 1833. In consequence of a gun-shot wound in the person of Alexis St. Martin healing in such a manner as to leave an artificial opening into the stomach, Dr. Beaumont was enabled to introduce various aliments directly into the stomach, and ascertain the chemical or solvent property of the gastric juice.

The gastric juice usually manifests an acid reaction to chemical tests, but chemists do not agree very well as to its actual chemical properties According to the analysis of Professor Dunglison, it contains free muriatic and acetic acids, phosphates and muriates of potassa, soda, magnesia, and lime. Blondlot imputes its acidity to super-phosphate of lime, while Professor Thornton and MM. Bernard and Barseswil attribute it to the presence of lactic acid; an acid which Liebig positively denies the existence of in a healthy stomach. These diversities in the results of analyses are probably due, in some measure, to the different methods of conducting them, in part to the different proportions or kinds of saline, alkaline, and earthy matters taken into the system with the food and drink, and in some degree to differences in the qualities or kinds of the aliments themselves.

The active principle of the gastric juice is called *pepsine;* its action is analogous to that of a *ferment*, which has the power of exciting chemical changes in the particles of other substances without undergoing decomposition itself. The quantity of gastric juice secreted is regulated by the *wants* of the system, and not by the quantity of food taken. Hence all excess of ingestion is a source of injurious irritation.

Chymification is that part of the digestive process in which the nutritious portion of the aliment is reduced to a pultaceous, homogeneous mass, called *chyme*. In addition to the solvent action of the gastric juice, chymification is aided materially by the contraction of the muscular coat of the stomach, whose fibres are so arranged as to diminish its diameter in all directions, and keep the food in constant motion until it is thoroughly permeated by the gastric juice, the pyloric orifice of the stomach being closed at the same time by the circular fibres acting there as a sphincter.

As fast as the alimentary mass becomes chymified, it is passed along into the duodenum. The most innutritious particles of the ingesta are not rendered chymous, but are reduced to a condition enabling them to pass through the alimentary canal with facility, to be expelled as excrementitious matter. Hence the fallacy of the doctrine lately advanced by Dr. Edward Johnson in his works on Hydropathy, and by some other European authors, that the fœces were *wholly* a secretion, an error which must have originated from observations made on

persons whose diet consisted almost wholly of animal and concentrated vegetable food.

In the duodenum the alimentary substance receives the *pancreatic juice* from the pancreas, and is there also mixed with the *bile* from the liver. The pancreatic juice is analogous in qualities to the saliva, and assists further to attenuate and resolve the particles of chyme into the condition best adapted for conversion into chyle.

Various opinions are entertained concerning the nature and uses of the bile. Some physiologists regard it as in part a vital secretion, and in some way auxiliary to digestion. The common notion that it is found in the stomach in a healthy state is erroneous. The stomach cannot endure and will not tolerate it. When accidentally forced there by reversed peristaltic action, the operation of emetics, or other morbid conditions, it produces violent tremblings, spasms, and vomitings, and sometimes convulsions. Others regard the bile as a mere chemical agent in separating the chyle, or nutritious part of the aliment, from the general mass of chyme; and others still look upon it as wholly an effete or excrementitious matter.

The fact that the bile is secreted from venous or impure blood, with which the liver is supplied, unlike any other organ in the body, seems to indicate that the office of the liver is to filter some of the accumulated impurities from the blood, before it returns to the heart, and the analyses of the bile pretty conclusively show that the liver is the depurating organ for certain combinations of effete carbon and hydrogen. Foreign substances have actually been found in the liver very soon after their reception into the stomach; substances which can never be found in the general circulation; a circumstance strongly corroborative of the opinion that the bile is, at least primarily, an excrementitious fluid. It may be, however, secondarily subservient to the economy of the digestive function, by mixing with the innutritious portion of the aliment, and lucubrating its passage, and by mingling with the oily matters, and favoring their solution by resolving them into a saponaceous mass; and also by its alkaline properties, neutralizing any surplus acid matter.

Fluids taken into the stomach are mostly absorbed from it without passing into the intestinal tube. When digestible solid and liquid aliments are taken into the stomach together, the aqueous portion is absorbed before the digestion of the solid matter commences; but indigestible substances must either be violently expelled by vomiting or purging, or more quietly thrown off by the excretories. When, therefore, their impression on the stomach is not strong enough to produce violent resistance, or the organic instincts are palsied in a measure by habit, they must necessarily be absorbed, and pass unchanged into the circu

lation. This is the case with metallic, mineral, and many earthy, alkaline, and saline matters, with all medical drugs, with alcohol in all its forms, tobacco, and with many articles employed as seasonings or condiments.

Chylification does not take place in the duodenum, for chyle itself is never found there. A still further process is required to elaborate a fluid which is to replenish the blood and supply all the structures. Another change is therefore effected by the *lacteal absorbent vessels*. The lacteals, or chyle-ducts, do not take up or absorb chyle from the alimentary tube, but *form* or manufacture it from the chymous mass; nor does the functional action of these vessels perfect or complete the process of chylification. The finishing elaboration takes place in the *mesenteric glands*, numerously distributed along the course of the lacteals, and formed by their enlargement and convolutions. On receiving the final action of the mesenteric glands, the chyle, fitted for nutrition, passes into the thoracic duct, and thence into the general mass of blood.

The innutritious portion of the food, mingled with and lucubrated by excrementitious matters in the form of bile, and such fœcal matters as are secreted by the mucous surface of the intestinal canal, are carried off by the peristaltic action of the bowels. The peristaltic motion of the whole alimentary canal is produced by the regular, gradual contraction of the circular muscular fibres from above downward, which motion is assisted and invigorated by the general compression on the whole surface of the abdomen produced by the free and energetic action of the external abdominal muscles.

Vomiting is effected by the reversed action of the muscular fibres, aided by the sympathetic and powerful contraction of the abdominal muscles.

Hunger and *thirst*, the sensations of which are referred to the stomach and throat, are indications of the wants of the general system. The rather ancient doctrines that hunger was produced by gastric juice in the stomach, and thirst by a dry condition of the mucous surface of the fauces, are clearly erroneous. Both sensations are organic instincts which communicate the need of the body for solid and liquid aliment to the common sensorium.

CIRCULATION.—The circulating system comprises the *heart* as its grand central organ; the *arteries*, which convey the blood to all parts of the body; the *capillaries*, which connect the arteries and veins; and the *veins*, which return the blood to the heart.

Commencing at the central point, the blood is received from all parts of the *venous system* into the *right auricle* of the heart; the auri-

cle contracts, and the blood is forced into the *right ventricle;* the right ventricle, contracting, sends it into the *pulmonary artery;* this artery divides into branches, which are ramified through the substance of the *lungs*, and bring the blood in contact with their innumerable air cells, where it throws off its surplus carbon, and probably receives oxygen or electricity, becomes changed from dark or venous to fluid or arterial, and is returned through the *pulmonary veins* to the *left auricle* of the heart; from the left auricle it passes into the *left ventricle*, and from thence it passes through the *arteries* to all parts of the body; the valves of the veins and of the different cavities of the heart preventing the current from receding.

The whole quantity of blood is estimated at about one fifth of the entire weight of the body, which is thirty pounds in a person weighing 150 pounds. The cavities of the heart hold about two ounces, three fourths of which is discharged at each contraction, and, counting seventy pulsations in each minute, a little more than six pounds of blood will pass through it in this time, or nearly 10,000 pounds in twenty-four hours. The whole quantity of blood probably passes through the heart once in four or five minutes.

The *frequency* of the heart's contractions—in other words, the beats of the pulse—gradually diminish from the commencement to the end of life. Immediately after birth the pulsations are 100 to 130; in middle life, 65 to 75; and in old age, 65 to 50.

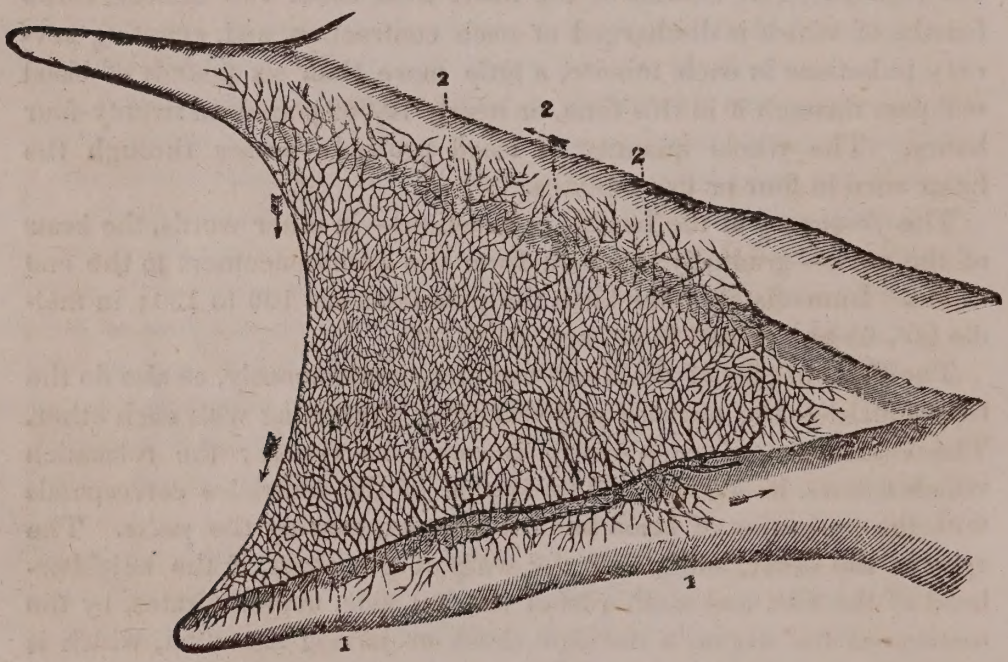
The two auricles of the heart contract simultaneously, as also do the two ventricles, the auricles and ventricles alternating with each other. The contraction of each cavity is called its *systole;* the relaxation which follows, its *diastole.* The systole of the ventricles corresponds with the projection of blood into the arteries, causing the *pulse.* The apex of the heart, being near the walls of the chest, in the neighborhood of the fifth and sixth ribs of the left side, communicates, by the motions of the organ, a decided shock or jarring sensation, which is called the *impulse* of the heart.

The *sounds* produced by the heart's action can be readily detected. By placing the ear on the front part of the chest, two sounds will be distinctly heard, following each other in rapid succession at each beat of the heart. These sounds are alternated with short intervals of repose. The first sound is the longest, and corresponds with the systole of the ventricles, the pulse in the arteries, and the impulse against the walls of the chest; the second, which is but half as long, corresponds with the diastole of the ventricles. The first sound is dull and prolonged; the second is short and sharp. The first sound is produced by the rush of blood through the comparatively narrow outlets of the

aorta and pulmonary artery, and its passage over the rough internal surface of the heart, aided by the muscular contraction of the ventricles and the heart's impulse. The second sound is evidently occasioned by the sudden shutting down of the semilunar valves at the orifices of the aorta and pulmonary artery.

The *capillary vessels* are a network of extremely minute vessels intermediate between the arteries and veins. This structure exists in all organic textures. The size of the capillaries is proportioned to that of the red particles of the blood, their diameters varying from $\frac{1}{1000}$ to $\frac{1}{5000}$ of an inch. They are not a distinct system terminating in open mouths, but merely fine tubes by which the arteries are continued into the veins.

Fig. 132.



CAPILLARY SYSTEM.

Fig. 132 represents the anastomoses of the blood-vessels, which form the capillaries, as seen in the web of a frog's foot by the aid of the microscope. 1, 1. The veins. 2, 2, 2. The arteries.

In the capillary vessels all the organic functions take place. Their circulation is to a great degree independent of the heart's action, and is, no doubt, influenced and regulated by the organic nerves, which preside over the functional process, and distribute the blood to the various parts and organs, according to the necessities of the vital economy. The sum of the diameters of all the capillary vessels greatly exceeds

that of the arteries and veins, which enables the blood in them to move slowly, and even sometimes take a retrograde direction to some extent, circumstances favorable to the perfect nutrition of the structures, the separation of worn-out material, and the consolidation of new.

In its passage through the capillary vessels the blood loses the vivifying properties and fluid color it received in the lungs, and becomes dark, impure, and charged with effete matter, resulting from the disintegration of the tissues. All the excrementitious or waste matters not collected into the excretory apparatuses of the several depurating organs, are carried along by the capillaries into the veins, to be purified in passing through the liver and lungs.

RESPIRATION.—Respiration is the function by which the blood is aerated or purified. It consists of the alternate inspiration and expiration of atmospheric air. The process of breathing has a two-fold relation to the animal economy. 1. The lungs, as depurating organs, eliminate from the blood a large proportion of the impurities and waste matters which it acquires in the capillaries, particularly its excess of carbon. 2. The lungs, as auxiliary nutritive organs, *digest* the inspired air, and separate, or rather *form* from it a principle convertible into the substance of the blood. Doubtless, too, they receive and transmit to the nervous system, through the medium of the blood, a constantly replenishing stream of that electric, magnetic, or other vital property on which the nervous influence depends.

The air which we ordinarily breathe, uniformly consists of about twenty-two parts of oxygen, seventy-seven of nitrogen, and one of carbonic acid gas, in one hundred. Other gaseous matters frequently exist, to a greater or less extent, in the atmosphere, from local causes, not as constituents, but as accidental admixtures, if we except ammonia, a compound of nitrogen and carbon, which appears to be ordinarily present in the proportion of one fourth of a grain to about 20,800 cubic feet. The constituent proportions of the atmosphere are found not to vary perceptibly in different latitudes, nor in low or mountainous regions.

The air expired from the lungs is found to have lost about sixteen parts of its oxygen, and gained about fourteen per cent. of carbon. As carbonic acid contains precisely its own volume of oxygen, fourteen of the sixteen parts of oxygen lost in the lungs *may be* employed in converting the effete carbon into carbonic acid gas, in which state it is expelled, and the remaining two parts of oxygen *may* serve as nutrient material. But as carbonic acid is found to exist already formed in the veins, and as animals placed in hydrogen or nitrogen still continue

to evolve carbonic acid, it appears clear enough that the greater part, if not all, of the carbonic acid gas expelled from the lungs is *formed in the tissues*, thus leaving the greater part or all of the oxygen absorbed from the inspired air to be used for other purposes than "burning up the carbon" in the lungs. This decarbonization and oxygenation of the blood changes it from a dark purple to a bright florid color. The oxygenation of the blood does not consist of the circulation of oxygen in the blood *as oxygen*, but is rather a process of aeriform digestion, by which oxygen is converted into electricity, analogous to the process of alimentary digestion, by which food is converted into chyle.

The nitrogen, which forms so large a proportion of the air we breathe, is sometimes increased, sometimes diminished, and at other times unchanged in quantity by respiration, which seems to prove that its absorption in or expulsion from the lungs depends on the wants of the organic economy, and probably is regulated by the sufficient, excessive, or deficient supply of the nitrogenous principle of the food.

The precise chemical process by which the change of the color of the blood is effected in the lungs, is still an unsolved problem. It has generally been imputed to the presence of iron. Liebig supposes iron to exist in the form of a carbonate of the protoxide in venous blood; and that in the lungs the carbonic acid is given off, leaving the protoxide, which, by union with half an equivalent of oxygen, is converted into the peroxide, and that this peroxide changes the venous blood into arterial. Liebig's theory, however ingenious it may be, has been disproved by Mulder, who has shown that the color is retained when all the iron is removed.

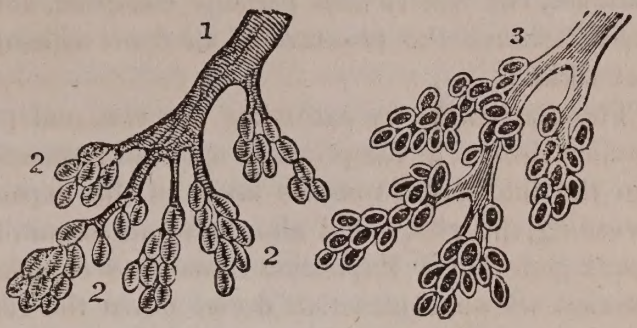
Respiration occurs in aquatic animals which do not breathe air. In them the respiratory organs are membranes prolonged externally into tufts or fringes, called *gills*, each one of which is supplied with arteries and veins, during the circulation of blood through which aeration is effected.

In air-breathing animals the membranous or aerating surface is reflected internally, forming passages or chambers in which the air is received, and on which the capillary vessels are distributed. Insects have a series of tubes ramifying through the whole body, and carrying air to every part.

In the human lungs the sides or walls of the air cells are formed of a thin transparent membrane, and the capillary vessels are placed between the walls of two adjacent cells, so as to be exposed to the action of the air on both sides. The number of the air cells of the whole lungs is immense. M. Rochoux has estimated them at six hundred millions.

Fig. 133 represents the bronchial tube, and its division into air cells, as much magnified. 1. A bronchial tube. 2, 2, 2 Air cells, or vesicles. 3. A bronchial tube and vesicles laid open.

Fig. 133.



BRONCHIAL TUBE AND AIR-VESICLES.

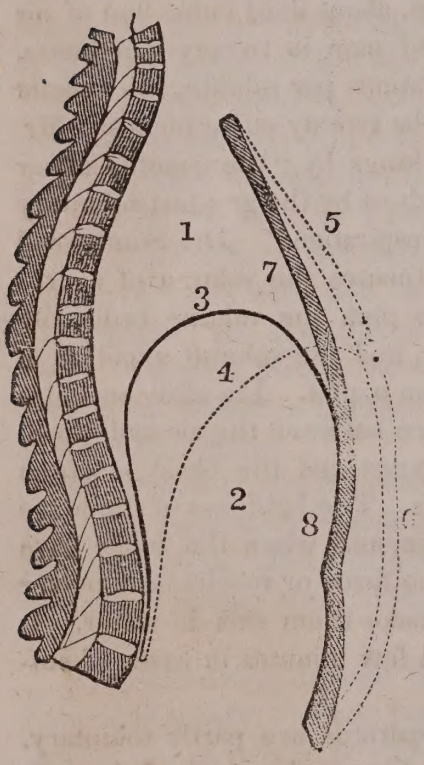
The capacity of the lungs varies greatly in different individuals. M. Bourgery concludes from his inquiries that the development of the air cells continues up to the age of thirty, at which time the respiratory capacity is greatest. According to the experiments of Mr. Coathupe, about 266¼ cubic feet of air pass through the lungs of a middle-sized man in twenty-four hours. At the average number of sixteen inspirations per minute, the amount of air received at each inspiration would be twenty cubic inches. Mr Hutchinson judges the capacity of the lungs by "the quantity of air which an individual can force out of the chest by the greatest voluntary expiration after the greatest voluntary inspiration." Dr. Southwood Smith, from a series of experiments, estimates the volume of air received at an ordinary inspiration at one pint, the volume ordinarily present in the lungs at about twelve pints, and the volume expelled at an ordinary expiration at a little less than a pint. He also concludes that in the mutual action which takes place between the air and blood, the air loses thirty-seven ounces of oxygen and the blood fourteen ounces of carbon every twenty-four hours. The lightness of the lungs depends on the residuary air they contain, and when the lungs have been once inflated by a full inspiration, no force or mechanical power can again dislodge the air sufficiently to make them sink in water. It is this residuary air which supports life a few minutes in cases of suffocation, immersion, etc.

The movements of the respiratory apparatus are partly voluntary, for the purposes of being subservient to voice and speech, and partly involuntary, for the purposes of aeration. The lungs themselves are entirely passive in respiration. When the walls of the chest are drawn asunder, and the thorax dilated, the external air rushes in to the air cells, distending them in proportion to the dilatation of the thorax, and keeping the surface of the lungs all the while accurately in contact with the walls of the chest in all their movements. But if air be admitted into the cavity of the pleura outside of the lungs, as by a pene-

trating wound of the thorax, the lungs cannot be fully distended by inspiration, but will remain partially collapsed, although the thorax expands, because the pressure of air from without the air cells balances that within.

The diaphragm, by extending the ribs, and pressing down the abdominal viscera, is the principal agent in inspiration; in a deep inspiration the intercostal muscles assist in the expansion of the chest by spreading the ribs, aided also, to some extent, by the muscles of the thorax generally. Expiration is mainly accomplished by the abdominal muscles, whose contraction draws down the ribs and compresses the viscera up against the relaxed diaphragm, thus diminishing the cavity of the thorax from below.

Fig. 134.



ACTION OF THE DIAPHRAGM.

Fig. 134 is a side view of the chest and abdomen in respiration. 1. Cavity of the chest. 2. Cavity of the abdomen. 3. Line of direction for the diaphragm when relaxed in expiration. 4. Line of direction when contracted in inspiration. 5, 6. Position of the front walls of the chest and abdomen in inspiration. 7, 8. Their position in expiration.

The connection of the respiratory function with sensibility, or the sense of feeling, is an interesting and as yet almost unoccupied field of inquiry. According to the experience of drowning persons—those who have remained from one to several minutes under water without breathing, and afterward been resuscitated—there is no pain after the complete suspension of respiration. Although intellectual consciousness remains, and mental conceptions are greatly exalted and intensified, all sensations of mere bodily suffering are absent. The anesthetic effects of ether and chloroform appear to bear a close relation to the extent to which the breathing is suspended. A complete unconsciousness to pain is attended with an extremely feeble and sometimes almost imperceptible respiration.

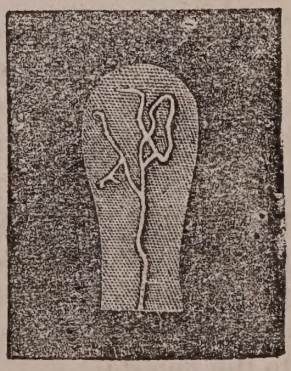
ABSORPTION.—The absorbent system proper comprises two sets of vessels with their glandular enlargements and convolutions—the *lac-*

eals and the *lymphatics*. The lacteals convey *nutritive* or new matter into the mass of blood, to replenish the tissues; the lymphatics take up and return to the blood the surplus nutrient materials, and also old or waste particles, in order that they may be used in the secretions, or got rid of at the excretory outlets. The function of the lacteals is called *external absorption*, or the absorption of *composition*; that of the lymphatics is called *internal absorption*, or the absorption of *decomposition*. *External* absorption also includes the absorption which takes place from the surface of the body and mucous membrane of the respiratory passages, as well as that performed by the proper lacteal vessels from the mucous surface of the alimentary canal. *Internal* absorption, sometimes called *interstitial*, also comprehends that which takes place from the component tissues of the organs, and the interior of short sacs, as well as that performed in the capillary vessels.

The veins belonging to the *external* division also act the part of absorbent vessels, but in a very different manner from the lacteals or lymphatics; these vessels exercise a selecting and transmuting power over the elements subjected to their action; hence the chyle and lymph are always found to possess nearly the same general properties. On the contrary, the veins imbibe and carry along unaltered all fluids or substances possessing the proper degree of tenuity to move in the current of circulation. It is well known that many poisons, alcohol, tobacco, the virus of venomous reptiles, etc., exert a much more deleterious effect when injected into the areolar tissue under the skin, than when taken into the stomach. In the former case they pass directly, unchanged, into the circulation; in the latter event they are modified, and more or less decomposed by the action of the absorbent vessels before entering the general system.

Alimentary absorption is effected mostly in the small intestines. The lacteals commence by *villi* in the mucous surface, each tube beginning in a single villus by a *closed* extremity; the trunk arising from each villus is formed by the confluence of a number of smaller branches, which anastomose freely with each other in the form of *loops*, as in fig. 135, never commencing in open extremities.

Fig. 135.

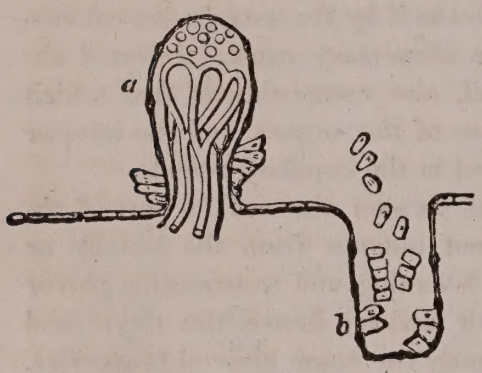


LACTEAL ORIGIN.

These loops are embedded in a mass of cells at the extremity of each villus; these cells exercise the selecting or transmuting power over the nutritive elements, when full their contents are yielded

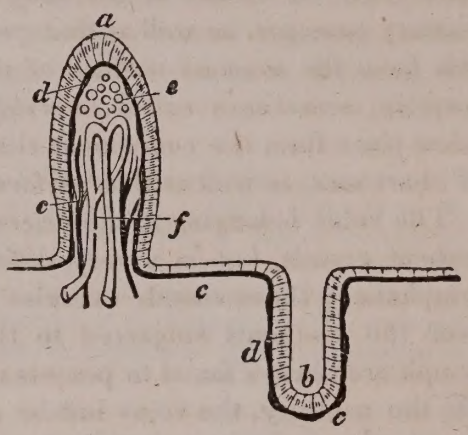
to the absorbent vessels, either by a process of deliquescence or bursting, their place being supplied by fresh cells, and so the process is continued till the nutritive material is exhausted; after which the villi, previously turgid, becomes flaccid, and the epithelium, which was removed during the process of absorption, is renewed; the lacteal vessels then become the interstitial absorbent vessels of the intestinal canal and act the part of *lymphatics*.

Fig. 136.



CHYLIFICATION.

Fig. 137



LYMPHATIC ABSORPTION.

Fig. 136 is a diagram of the mucous membrane during digestion and the preparation of chyle. *a*. A villus, turgid and erect; its protective epithelium cast off from its free extremity; its absorbent vessels, lacteals, and blood-vessels turgid. *b*. A follicle discharging its epithelial cells.

Fig. 137 is a representation of the same mucous membrane when chylification is not going on. *a*. Protective epithelium of a villus. *b*. Secreting epithelium of a follicle. *c, c, c*. Primary membrane, with its germinal spots, or nuclei, *d, d*. *e*. Germs of absorbent vesicles. *f*. Vessels and lacteals of villus.

The *chyle* in the lacteals is almost invariably of the same chemical composition, however diversified the character of the food from which it is formed. It is not, however, always of the same *vital* quality; for that which is made of animal food, when taken from the body, undergoes putrefaction much sooner—in three or four days—while that which is selected from vegetable food resists decomposition out of the living organs for several weeks. Its milky color depends on the presence of minute corpuscles, called *chyle globules*. Usually it contains fatty, albuminous, fibrinous, and saline matters, in varying quantities, according to the ingesta.

The *lymphatics* exhibit no essential anatomical difference in origin, structure, or arrangement from the lacteals. They are distributed

throughout almost every part of the body, and very numerously upon the skin.

The *lymph*, an almost colorless fluid, which the lymphatics convey to the thoracic duct, very closely resembles the chyle, the main difference consisting in the color of the latter. Its *source* is a matter of conjecture. Dr. Carpenter supposes the matters absorbed by the lymphatics to consist of the residual fluid, which, having escaped from the blood-vessels into the tissues for their nutrition, is now returned to the former. Probably they also contain a portion of the decayed and worn-out particles of the structures. The lymph, like the chyle, contains peculiar self-coagulating corpuscles, and both fluids contain the same ingredients, though in different proportions, for the organic elements are much more abundant in the chyle.

The *glandular* laboratories, through which the lacteals pass, are the ganglia of the mesentery; and those of the lymph-vessels are the lymphatic glands. In these ganglia both fluids are doubtless still further changed, elaborated, and fitted for circulation, nutrition, or expulsion. That these ganglia exercise a supervisory function over the economy of nutrition, acting as sentinels to prevent the introduction of an enemy into the vital domain, is evinced by the fact that when any foreign, injurious, or poisonous element gains admission into the absorbent vessels, whose presence in the general circulation would be immediately dangerous to life, these glands, in the language of some physiologists, "take on inflammation" to arrest its progress. In less ambiguous phrase, the glandular follicles contract their diameters, obstruct the passage, attract an additional supply of blood, and thus hold the aggressor in check until the reinforcement of vital power can so change, modify, or destroy the invading foe, that its elements may pass along with impunity or with greatly diminished danger to the organism.

The *extremities of the veins* are the principal absorbents for taking up the really effete and decomposed matters of the decaying tissues, as well as the accidental impurities of the body; although the lymphatics sometimes take up excrementitious matters, as bile, pus, venereal and other virus brought in contact with them.

Absorption from the skin has been called *accidental*, because the fluids pass in by simple imbibition. The rapidity of this absorption is mainly influenced by the condition of the blood-vessels, being most active when they are most empty, and least so when they are full. When the epidermis is removed, as by a blister, the external integument absorbs with great rapidity. Frequent bathing followed by friction, increases its absorbing powers.

Absorption by imbibition is effected by both veins and lymphatics. In the mucous membrane of the lungs and stomach, the thin fluids are taken up by the veins, and it may be stated as a general law of the absorbent system, that wherever a thin fluid is placed in contact with an extended surface, it will be taken up by those vessels which present the largest surface and the thinnest walls. It is difficult, however, to explain the absorption of fluids from serous cavities on the principle of imbibition alone.

Probably the most clear and correct general view of the function of absorption may be presented in the following summary: The venous extremities, acting as absorbent vessels, take up the greater portion of useless, injurious, or worn-out matters; the lymphatic vessels return the unused or surplus recrementitious matters, and also serve as auxiliary vessels, or special provisions to guard against obstructions when the functions of the veins are overtasked or imperfectly performed. The elements of the blood in the capillary system are exhaled through the coats of the vessels, and there undergo certain chemico-vital changes. Such elements as are needed to repair the waste, and build up the structures of the body, are assimilated and become a component part of the body; other elements are separated, and so re-combined as to form the secretions, and waste particles are carried back into the circulation to be changed or thrown off.

If the processes of alimentation and exhalation overdo those of absorption and depuration, accumulation takes place in the cellular membrane or serous cavities, of adipose or watery matter, and obstruction exists in the form of corpulency or dropsy. Hence obesity is as truly an abnormal or diseased state as dropsy.

NUTRITION.— Nutrition, more properly termed assimilation, is the actual accretion of the alimentary matter to the organism—the completion of the class of nutritive functions. The food, masticated and insalivated in the mouth, acted upon by the gastric juice in the stomach, and the pancreatic juice in the duodenum, still further elaborated in its passage through the lacteals and mesenteric glands, and finally oxygenated in the lungs, is not yet fitted for nutrition. The nutrient process is not accomplished until the alimentary matter is subjected to the finishing action of the capillary vessels. It is here converted into the congenial elements of the several structures, becoming a component part of their substance.

Though the arterial blood supplies the nutrient material to every part and structure of the body, yet this blood does not contain all the proximate elements of the body *as such*. For example, gelatin, which

enters so largely into the composition of the animal structures, is never found in the blood in the state of gelatin. This shows again the power of the living organism not only to decompose and recompose the elements of sustenance, but even to transmute one substance, which chemistry regards as a simple element into another.

The processes by which the various changes of matter take place in the capillary system have been the subject of much chemical research and speculation in modern times. But here, as in all cases where the operations of a living principle are approached, chemistry is and must of necessity be at fault. Chemistry may reduce and refine, divide and subdivide all the forms of organic matter to their ultimate elements, or to a certain set of ultimate results or substances, by a process of *destructive* analysis. It may readily *destroy the evidence* of the life principle, but the chemist's skill can never recombine the elements so as to restore or reproduce the manifestation of vitality. All attempts, therefore, to explain the phenomena of life by the demonstration of chemical problems, are to be regarded only in the sense of analogies. Experiments have shown that saline ingredients, dissolved in water may be decomposed by an electric stream. If a solution of salts be placed in a glass tube having a membranous covering at its extremities, an electric current will not only separate their constituent elements, but deposit some of them on the *outside* of the membrane. Reasoning analogically, we may suppose that the organic nerves transmit the electric principle, which, like the continuous operation of a galvanic battery, separates the materials of the blood into their simplest forms, enabling the play of organic affinities to attach each particle of matter to a congenial particle, and thus replenish or augment the structures. Each atom of matter is evidently *polarized*, that is, possessed of points or properties of attraction and repulsion toward all surrounding atoms, which enable it to assume determinate relations of aggregation or separation toward all other atoms of the same or of different matter.

To this view, that the organic nerves are *necessary* to the nutritive process, it may be objected that nutrition is just as perfect in vegetables, which have nothing analogous to a nervous system. But animal nutrition, unlike vegetable, requires sensation, locomotion, and mind to appreciate, move after, and judge of the materials of nutrition; and the office of a distinct nutritive nervous structure is to associate the operations of mind and the special senses with the voluntary muscles, as well as to energize the involuntary muscles, in the performance of this function. Were animals, like vegetables, "fixed to one peculiar spot," and their only functional economy "to draw nutrition, propagate

and rot," there would be no necessity for either a motory, or sensory, or mental nervous system.

Mere increase of bulk is not nutrition. Morbid depositions of matter which is not assimilated may take place, as in tubercles, wens, encysted dropsy, etc., and the *embonpoint* of persons who are called "high livers," though indicative of excessive alimentation, denotes *defective* rather than excessive nutrition. When the whole body is loaded with fatty accumulations, assimilation is never as perfect, nor the structures as firm, round, and elastic, nor the body as powerful and enduring, nor as capable of sustaining depletion and prolonged fasting, as in a moderately lean condition of the system.

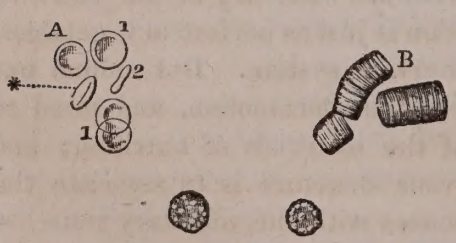
In those abnormal growths called *hypertrophy*, there is an actual increase of substance identical with the hypertrophied tissue or organ; while in the opposite state, *atrophy*, there is an absolute deficiency of assimilated matter. In the former case the nourishment of the structure is greater than the waste; in the latter the waste is greater than the replacement.

Cancerous and *fungous* growths proceed by a similar process of cell-development to that of the original structures, but from some disturbing cause, the nutrient particles are arranged according to a new and abnormal scale of chemical affinities.

Many speculations have been indulged respecting the time in which the whole body is renewed, the extremes of the calculations having generally been *four* and *seven years*. The period must vary greatly, according to habits of life, amount of exertion, kind of food, etc. Probably many bodies are renewed in a much less time than four years.

The coagulation of blood out of the body affords a good illustration of the law by which the primary atoms are arranged in the building up of the tissues, as represented in the cut.

Fig. 138.



CORPUSCULES OF THE BLOOD.

In Fig. 138, A represents the blood-corpuscles as seen on their flat surface and edge. B. Congeries of blood-corpuscles in columns. In coagulating, the corpuscles apply themselves to each other, so as to resemble piles of money.

Though the blood is the immediate source of all nutrition, many structures, as the tendons and ligaments, do not receive *red* blood. The coloring

matter which surrounds the corpuscles, therefore, is not essential to the nutritive quality of blood. Many fishes, reptiles, and insects have no red blood. Dr. Carpenter has made the following convenient table, showing the distribution of the constituents of human blood in living and in dead bodies.

Living Blood.	Fibrin, Albumen, Salts,	In solution, forming Liquor Sanguinis.
	Corpuscles,	Suspended in Liquor Sanguinis.
Dead Blood.	Fibrin, Corpuscles,	Crassamentum, or clot.
	Albumen, Salts,	In solution, forming serum.

Secretion.—Secretion literally means *separation;* but the process by which a new substance is produced by a re-arrangement of the elementary matters contained in the blood is one of *formation.* Secretion, therefore, is not the separation but the *production* of a proximate element from the blood. Each organ or structure secretes or forms its own peculiar fluid, serving some special purpose in the animal economy. The mucus and serous fluids poured out on the surfaces of mucous and serous membranes, are regarded as *exhalations*, mere exudations by the process of exosmose, rather than secretions.

All the cavities of the body which open externally, as those of the nose, mouth, alimentary canal, trachea, bladder, and uterus, are lined with a *mucous* membrane, which secretes or exhales a bland, slimy fluid, called *mucus.* This mucus serves to moisten and lubricate their surfaces, facilitate the passage of crude matters, and protect them against the action of acrid and irritating agents.

All the internal surfaces of cavities not opening externally, as those of the abdomen, chest, heart, brain, and joints, are lined with a *serous* membrane, from which secretes or exhales a thin watery fluid, called *serum*, whose office is to facilitate the motions of their surfaces.

Some of the secretions are wholly *recrementitious*, being for the use of the animal economy, as the saliva, chyle, gastric juice, and synovia; others are wholly *excrementitious,* being mere waste material, as sweat, urine, bile, and fœces. Some of the excrementitious secretions are made subservient to organic purposes, as the bile and ear-wax; and some of the organs secrete a nutrient and expel an effete material at the same time, as the lungs and skin.

Fig. 139.

GLANDULAR SECRETION.

There are three forms of secreting organs. The simplest form is that of the animal membrane, which is abundantly supplied with blood-vessels, and covered with an epithelium, as the serous and synovial membranes the next form is the inversion or depression of the membrane, constituting the *follicle;* and the last is the *gland*, an aggregation of follicles.

Fig. 139 represents the follicles, multiplied and clustered together upon efferent ducts common to several of them, the duct converging to form the main excretory duct, the whole constituting a secreting gland.

The important agents in secretion, as well as in nutrition, are *cells*, which are developed upon the lining membrane of the follicles and tubes, and which elaborate the matter of secretion from the blood, and pour it into the excretory duct. The cells, as in the case of nutrition, are constantly being cast off and reproduced.

The follicular secretions are divided into the *mucous* and *cutaneous* Of the former character are the ordinary follicles of mucous membranes, and the numerous glandulæ of the intestinal canal; the simple and the compound *gastric follicles* of the stomach, which secrete the *gastric juice;* the *glands of Brunner* in the duodenum; the *glands of Peyer* in the jejunum and ilium, which are supposed to secrete the putrescent elements of the fœces; the *follicles of Lieberkühn*, distributed through the whole intestines, but especially numerous in the small intestines, and which secrete a thick, tenacious mucus; the *large follicles* in the cæcum and rectum, producing slight elevations on their surfaces; the *glands of Duvergny* and *Nabothi*, in the vagina and cervix of the uterus in the female; and the *glands of Cowper* and the *prostate*, in the male, The *tonsils* also are considered as a collection of lubricating mucous follicles.

The cutaneous division includes the *meibomian follicles*, which are seated in the tarsal cartilages, and secretes the gummy fluid that lubricates the edges of the eyelids; the *ceruminous*, which secretes the thick resinous substance called *ear-wax;* the *sebaceous*, which pour out an *adipose matter* upon the skin; and the *sudoriferous*, which secrete the proper *perspirable matter.*

The sweat glands have been estimated by Mr. E. Wilson at about *seven millions.* As their secretion is usually evaporated as fast as formed, most of the perspirable matter passes off in the form of *insensible* perspiration. Perspiration is *sensible* only when excessive, or

when it accumulates upon the skin by a moist state of the atmosphere. In the armpit is a peculiar description of glandules, called *odoriferous* or *miliary*, which secrete an odorous matter characteristic of that part of the body. This odorous principle is said to differ in animals sufficiently to afford a test by which their blood can be distinguished. A few months ago I had a patient under treatment in whom the odor from the axillary glands was so strong and fetid as to make his presence disagreeable, especially in a warm room. It has been alleged that the blood of the female can be distinguished from that of the male by the peculiar odor from this source; an opinion which I am inclined to think has more fancy than fact about it.

The *glandular secretions* are the *lachrymal*, or *tears*, from the lachrymal gland, which lubricates and cleanses the conjunctiva; the *salivary*, formed by the *parotid*, *submaxillary*, *sublingual*, and *pancreatic glands*; the *bile*, found in the *liver*; the *urine*, found in the *kidneys*; the *spermatic* secretion of the *testes*, and the *mammary* secretion of the *breasts*. The milk is more affected by the food and drink of the mother than any other secretion, and also by strong passions or emotions of the mind. Instances have been known in which a single violent fit of passion, or other paroxysm of excitement, has so changed the quality of the milk as to destroy the life of the nursing child in an hour.

The *spleen*, *supra-renal capsules*, *thymus* and *thyroid glands*, have been called *vascular glands*, or *glandiform ganglia*, although they form or secrete no peculiar fluid, and have no excretory duct. Physiologists generally regard them as reservoirs for an excess of blood in neighboring organs, the spleen being the diverticulum for the stomach and liver, or the portal circulation; the thymus to the lungs in fœtal life, the thyroid to the brain, and the supra-renal capsules to the kidneys.

THE EXCRETORY ORGANS.—Those organs which perform the *excretory* part of the secretory function are the *lungs*, *skin*, *liver*, *bowels* and *kidneys*. All the excretory organs are capable of vicarious function, doing the work of each other to a great extent, though the lungs and liver, skin and kidneys, most intimately reciprocate in functional duty. The lungs and liver are the special depurating organs for the surplus carbon and hydrogen; the skin and kidneys for the nitrogenous products of decomposition; and the bowels throw off the more complex proximate elements of waste matters and fœcal secretions.

The depurating as well as nutrient function of the *lungs* has already been considered.

The *skin* is not only a cleansing organ, but, like the lungs, a breathing

organ; for it really absorbs oxygen, and throws off carbonic acid gas Next to the lungs the skin is the most extensive as well as important detergent structure of the body. The amount of solid matter eliminated from the body through this emunctory is, on the average, about 100 grains per day. The amount of fluid thrown off is more variable, depending on external temperature, quantity of drink, activity of the kidneys, etc. The estimates of the transpiration from the cutaneous and pulmonary surface in twenty-four hours are from 1¾ lb. to 5 lbs., nearly three fourths of this amount passing from the skin.

The *liver* secretes the matter of bile from the venous blood. The object of the biliary secretion evidently is to eliminate certain impurities from the body in the form of compounds of carbon, hydrogen, and nitrogen, and also to deterge the blood of a portion of any excess of alkali that may be absorbed by the venous extremities.

Liebig has fabricated a singularly inconsistent hypothesis, which has satisfied himself and all others who are satisfied to echo his arguments without taking the trouble to examine them, that the bile is a nutritive product, and that, consequently, whatever will tend to the formation of bile, or any of the proximate elements usually found in bile, is a useful and nutritive substance. Liebig reasons in this wise. The bile is composed of several certain proximate elements. One of these is called *taurine*. This taurine is the only compound or proximate element found in the bile which contains *nitrogen*. Now *theine* and *caffeine*, the active principles of tea and coffee, are found, on chemical analysis, also to contain a very small quantity of nitrogen; *ergo*, tea and coffee, though injurious stimulants to the nerves, may be useful to the liver by furnishing the nitrogenous element of the taurine of the bile! Such reasoning is extremely absurd, and the error is a most palpable one. It consists in mistaking a waste material for an aliment; a depurating process for a nutritive one. As well might one mistake putrid flesh for wholesome food, because it contains carburetted hydrogen, which is also found in the fœces, or excrementitious matters of the bowels.

The *kidneys* eliminate from the system a large proportion of effete saline, alkaline, and earthy particles, and the greatest portion of the surplus nitrogen. The average amount of urine excreted in twenty-four hours has been estimated at from thirty to forty ounces. Of course it depends greatly on the activity of the skin, amount of fluid taken into the stomach, moist or dry, hot or cold state of the atmosphere, etc. The amount of solid organic matter expelled daily by this emunctory has a close relation to the activity and corresponding waste of the muscular tissue, and this is determined with considerable accuracy by the

amount of *urea* in the urine; a test, however, of no practical value in treating diseases.

The "brick dust" sediment, "chalky deposits," and "albuminous" appearance of urine, are dependent to a very great extent on the character and purity of the food and drink. The long-continued employment of what are very absurdly called "medicated waters," containing carbonates of lime, soda, iron, and magnesia, chloride of soda, sulphates of lime and magnesia, muriate of lime, sulphur, sulphuretted hydrogen, iodine, hydriodates of soda and potash, etc., as well as all very hard and impure water, is a common cause of gravel, stone, calculous concretions, etc., and a prolific source of diseases of the kidneys and bladder.

The total suspension of the urinary secretion is attended with rapidly fatal results, the patient manifesting symptoms like those produced by narcotic poisons.

The *bowels* are the emunctories for such innutritious portions of the food as do not pass into the circulation, and are not taken up by the lymphatics or venous extremities, and carried to other depurating organs; and also such waste and worn out particles as are secreted in the form of fœces. The quantity and character of the dejections depend much on the nature of the ingesta. As the contents of the alimentary canal pass along, their fluid portion is gradually withdrawn, and they acquire a firmer consistence; they also become more fœcal in character as the putrescent elements of the blood are secreted by the various glandules along the intestinal tract.

CALORIFICATION.—Many speculations have been indulged by chemists and physiologists, in relation to the production of animal heat Since the publication of Liebig's elaborate work on Organic Chemistry the notion has become generally prevalent among the scientific circles and from them it has been promulgated among the non-scientific people, that the production of animal heat is a mere chemical process the lungs serving as a stove or fire-place, and the carbonaceous substances of the food serving as fuel "to be burned in the lungs." According to this theory, fatty substances, animal oils, and other matters containing a large proportion of carbon, are not only useful but absolutely necessary to keep up the requisite degree of animal temperature. The position seems to me as almost self-evidently absurd, and it has certainly led many persons into the most egregious blunders practically, and at the expense, too, of their own common sense and common observation.

All the organic functions of the body—the vital processes—are in

one sense chemical. They are not, however, such chemical decompositions and re-combinations as are performed in a chemical laboratory They are not such as the chemist can ever demonstrate or imitate. They not only change the relative proportion of elementary matters but absolutely transmute elements into each other, reduce several of what we call elements to one, and separate one into several. All the chemico-vital processes—respiration, digestion, circulation, secretion etc.—are attended with the elimination of heat; in other words, latent caloric becomes sensible by these changes of matter. But all the organs, by virtue of their own specially presiding centres of nervous influence, are, to some extent, self-regulating in their temperature, while the entire body possesses a general self-regulating power. The principal organ whose function serves as a universal regulator and equalizer of animal temperature, is the skin. When in vigorous and healthy condition it throws off the surplus heat, or retains the deficient, according to the necessities of the organism. There is no need of a fire and boilers to warm up the blood, as the water is heated by the machinery of a steam-engine, and for this simple reason I think nature has not provided them.

The error lies here. Liebig and his followers have mistaken an excrementitious or cleansing process for a nutritive or supplying one. They have misconceived the function by which the body rids itself of waste matters, and called it a useful and indispensable condition of vitality. They have supposed the chemical process by which nature throws off the effete carbon through the lungs to be a method of furnishing animal heat. This, I think, can easily be made manifest.

According to the theory of animal heat I am controverting, fat, suet, tallow, lard, marrow, grease, butter, blubber, and fixed oils, should constitute healthful food; and such is, indeed, the conclusion of Liebig's followers. But the common experience of all mankind is against it. Common observation says that these articles, though to some extent sufferable, are not strictly wholesome; and further, medical men generally disallow these articles to their patients when they are very much reduced with disease, at the same that the animal temperature is very low, and requires such food, if ever. Again, corpulent persons, who are surcharged with carbon, do not bear cold better than lean persons, who have little; in fact they are, other circumstances being equal, more sensitive to it.

But if fats and oils are useful as fuel for the pulmonary warming-pan, because of their larger proportion of carbon, alcohol would be useful in the same way, on exactly the same principle. Accordingly, strange as it may seem, we find Pereira, in his able *chemical* work on

Food and Diet, adopting alcohol as an alimentary principle! Alcohol an aliment, a food, a nutritive material! Can any thing be more ridiculous?

Now alcohol contains more carbon than most kinds of animal or vegetable food, except animal oils or fats; and, in the chemical theory we are considering, ought to be just as useful as an "element of respiration;" and so by a single vagary of modern science we are thrown back to the errors of four thousand years ago. Pereira says: "Alcohol, therefore, is a *fuel* in the animal economy, and by its oxidation in the lungs, must evolve caloric, and *serve* to support the temperature of the body." Now let us hear his argument: "Alcohol is an element of respiration. Common experience favors this view. Coachmen and others take it in cold weather to keep them warm, and it is familiarly used to prevent what is commonly called 'catching cold.' In cases of extreme suffering and exhaustion from excessive exertion and privation of food, the cautious and moderate *dietetical* use of spirit has, on many occasions, proved invaluable. In Captain Bligh's account of the sufferings of himself and companions, in consequence of the mutiny of the crew of the Bounty (in the South Seas, in 1787–9), he observes: 'The little rum we had was of great service; when our nights were particularly distressing, I generally served a teaspoonful or two to each person, and it was joyful tidings when they heard of my intentions.'"

Here the *pernicious* effects of a positive *poison* are mistaken for the *useful* results of natural *aliment!* As long ago as 1787, the opinion was generally entertained that "a little rum" was a sort of elixir vitæ, warming the body when cold, cooling it when hot, drying it when wet, and wetting it when dry, as well as sustaining it when famished, and regulating it when full. More enlightened observation has discarded these absurdities, and it is to be regretted that they should be revived again by medical philosophers.

Though Pereira asserts and tries to prove the utility of alcohol in the animal economy, he allows it is injurious at the same time, thus involving his theory in still greater confusion. He says: "Though alcohol evolves heat in burning [in the lungs], it is an obnoxious fuel." Does not this admission prove that the heat evolved by the use of alcohol is simply the result of the effort of the organism to get rid of it? This would be the heat of fever or inflammation; a heat much more calculated to wear out and prematurely exhaust the animal economy than to support it. And this view, I venture to say, is confirmed by all human experience.

Moreover, against Pereira's far-brought testimony in favor of the

dietetic use of rum, we can quote any amount of controverting evidence Liebig himself admits that "the development of heat in the body, after the use of wine, increases without the manifestation of a corresponding amount of mechanical force. A moderate quantity of wine in women and children unaccustomed to its use, produces a diminution of the force necessary for voluntary motions. *Weariness, feebleness in the limbs*, and *drowsiness*, plainly show that the force available for mechanical purposes, in other words, the change of matter, has been diminished." Rev. Mr. Scoresby testified before a committee of the British House of Commons, in 1834: "My principal experience has been in severely cold climates, and there it is observable that there is a very pernicious effect in the reaction after the use of ardent spirits. In the case of a storm, or other sudden difficulty, I should most decidedly prefer the *water-drinkers* to those who were under the influence of *any stimulant*." Sir John Ross testifies that: "Having in the Arctic regions, in his own person, experienced the beneficial effects of abstaining wholly from spirituous drinks, he proposed to his men that they should try the same experiment, which was done with the most gratifying results. When men under hard and steady labor are given their usual allowance of grog, they become languid and faint, losing their strength in reality, while they attribute that to the continuance of their fatiguing exertions. He who will make the corresponding experiments on two equal boat's crews, running in a heavy sea, will soon be convinced that the water-drinkers will far outdo the others." Dr. Rush says: "The temporary warmth produced by spiritous liquors is always succeeded by increased chilliness, rendering the body still more liable to be affected and injured by cold." These authorities could be extended, but we have already enough for our purpose. All the facts we can find which bear at all on this subject, go to prove most indubitably that alcohol is in every sense exactly the opposite of an "element of respiration." It is indeed a "fuel in the animal economy," in the same sense in which any accidental combustible substance creates a flame which burns our dwelling-house to the ground.

The whole argument, *pro* and *con*, will apply equally to animal fats and oils, with this qualification. Greasy matters, though composed mostly of waste, useless, and excrementitious materials, which have accumulated in the cellular repository, because the process of alimentation was increased beyond that of elimination, are not strictly poisonous They contain doubtless a very small quantity, yet very impure quality of substances convertible into nutriment. But, as food, they are to be regarded as next to venous blood in grossness and impurity.

They contain about eighty per cent. of carbon; hence, when freely taken into the system, the lungs, as the principal excretory organ for effete carbon, has an additional duty to perform in throwing it off. This increased labor is, as a matter of course, attended with an increased temperature of the body, simply because there is a greater amount of matter than is natural or necessary to be disposed of. But this, as in the case of alcohol, is an extraneous, useless, exhausting labor, which wears out the machinery of life with inordinate rapidity. If the excessive quantity of carbon is constantly supplied in the diet, the organism must prematurely wear out, or break down with disordered action. If fatty matters are only occasionally eaten, the temporary increase of temperature will be followed by depression and debility, precisely as with alcohol, though much less in degree. The lungs, however, do not "burn up"—oxidate—all the surplus carbon of grease, oils, gravies, etc., for we see in most persons addicted to their free use, pimples, blotches, eruptions, swellings, boils, and cancerous ulcerations, with evidences of bad blood, torpid brains, and glandular obstructions, clearly traceable to this habit, and curable by its discontinuance. The principal injurious effect, therefore, of animal oils and fats is not from their large quantity of carbon, but from their intrinsically impure character. In all pure, healthful, and natural alimentary substances, the system can appropriate what carbon it requires, and dispose of the remainder without injury, obstruction, or excitement, be the quantity contained in the alimentary article more or less. All the grains, esculent roots, and fruits, as well as the flesh-meat of animals, contain exactly the right proportions of carbon in their composition for perfect nutrition, respiration, and animal heat, however much their respective quantities of carbon may vary. They are also universally allowed to be "easily digestible," and innocuous to the stomach in all normal conditions of the digestive powers. Not so with greasy matters.

Pereira himself says, directly in the face of his argument in favor of the use of grease for the benefit of the lungs: "*Fixed oil or fat* is more difficult of digestion, and more obnoxious to the stomach, than any other alimentary principle." Can any body tell why an alimentary article which is so necessary to the lungs should be so obnoxious to the stomach, unless nature has made a very great blunder? The whole theory of a respiratory alimentary principle seems to me preposterous in the extreme.

It is further urged, in favor of this wild conclusion from a false starting point, that people in very cold climates, the Esquimaux, for example, consume immense quantities of blubber oil, tallow candles when they can get them, fatty matters of all kinds that they are able to procure, as

well as enormous quantities of flesh or fish, as they can catch it; and simply because they do these things, and live in a cold climate where they can get little else, the inference is drawn that it is necessary they should so eat to get carbon in the body, to be "burned in the lungs" to support the animal temperature. It is very true that a cold, rigorous climate enables the digestive organs to bear what would destroy life very soon in a warm climate. It is also true that these blubber-oil eaters, and all the tribes of men whose dietetic habits are similar, are a very inferior race, and in them nothing is developed scarcely, save the mere animal nature; hence their stomachs have all the nervous power almost of their whole constitutions. More than this, their animal nature is itself actually inferior in muscular power to that of those tribes and races of men whose general regimen is comparatively free from fats and animal oils.

From all the arguments and facts I am able to gather, the conclusion is unavoidable, that this notion of pouring carbon into the stomach to support respiration and manufacture animal heat, is just as absurd as the common fallacy of heating, peppering, and stimulating the stomach with spices, pills, and spirits, to aid digestion. Moreover, the theory of the combustion of carbon in the lungs sufficiently to heat up the body is positively disproved by the fact that most of the carbonic acid expelled from the lungs is really formed in the tissues distant from the lungs.

There is no doubt that the oxygenation of the tissues throughout the system, and the combination of oxygen with carbon, are sources of animal heat, in common with all the organic functions and chemical changes which take place in the body. All the conditions requisite to the due regulation of the animal temperature are good digestion, free respiration, vigorous circulation, proper assimilation, and perfect depuration, in two words—*good health.*

The ordinary temperature of the human body ranges from 98° to 100° Fahr., varying but very few degrees above or below when the surrounding atmosphere is greatly elevated or depressed, nor under the most violent fevers or extreme states of debility and emaciation. That *cutaneous respiration* is subservient to the maintenance of the equal temperature of the body, is evident from the fact that if the hair of animals be shaved off, and the bare skin covered with varnish, the temperature instantly falls.

Endosmose and Exosmose.—Dutrochet discovered and Liebig has demonstrated certain facts in relation to the interchange of dissimilar fluids in different parts of the anima structures, which facts to

gether have been called the laws of *endosmosis* and *exosmosis*. According to a principle of these laws, whenever any animal membrane has one of its surfaces in contact with a different fluid, an interchange takes place; a part of the fluid on the outside passes to the inner surface, while a portion of the fluid on the inside passes through and mixes with that on the outer surface, the interchange continuing until both fluids become similar. The term endosmose means *imbibition*, and is applied to the current passing from without to within; exosmose means *transudation*, and is applied to the passage of the fluid from within to without.

If a solution of any salt, or of sugar, is poured into a glass tube closed below by a piece of bladder, the particles of the solution permeate the pores of the bladder, but do not pass through it. If the tube thus filled is placed in a vessel containing distilled water, the fluid gradually rises within the tube, and sometimes to the extent of several inches, while at the same time it is found that a portion of the solution has passed from the interior of the tube to the water external to it.

It is said that in order to have these phenomena manifest, the fluids must be of *different densities*, and that there must also be an *affinity* between the membrane and the fluid, or no current will take place. *Gases*, as well as fluids, are diffused among each other, even through the compound textures.

These properties of the tissues, which are also possessed by some inorganic substances, as thin plates of slate or of baked clay, are extremely important in relation to the treatment of diseases, especially in cleansing the body from drug-medicines and other impurities, circumstances which will be noticed more particularly in the therapeutic department of this work.

NOTE.—The REPRODUCTIVE function will be considered in PART VIII.

CHAPTER V.

OF TEMPERAMENTS.

TEMPERAMENTS are peculiarities of organization. Marked differences in individuals, occasioned by the disproportionate development of some one or more of the systems or tissues, have been noticed since the earliest times. Galen distinguished these differences into the *sanguine*, *phlegmatic*, *lymphatic*, and *melancholic* temperaments, a distinction based on the supposed preponderance of some one of the four

elements—air, water, fire, and earth. Various divisions of the temperaments have been proposed by modern physiologists. Dr Caldwell bases the three principal temperaments on the three principal cavities of the body; the *cerebral* or *mental* temperament, existing when the *cranium* is most capacious, the *sanguine* when the *chest* is large, and the *lymphatic* when the *abdomen* predominates.

The temperaments usually recognized, and which are as satisfactory as any other classification for practical purposes, are the *nervous*, *sanguine*, *bilious*, and *lymphatic*. The nervous and sanguine are the *irritable* or *active* temperaments; the bilious and lymphatic are the *inirritable* or *torpid* temperaments. The former dispose to more rapid motion and greater activity, with less power of endurance; the latter are less easily excited to action, but more powerful and enduring. The former enjoy or suffer with the greatest intensity; the latter are incapable of the same extremes of feeling. When all the systems and parts of the body are equally developed, the temperament is called *balanced*.

Fig. 140.

NERVOUS TEMPERAMENT

Fig. 141.

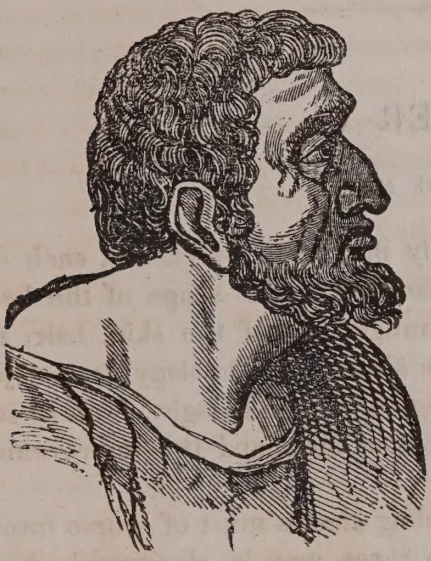
SANGUINE TEMPERAMENT.

The Nervous Temperament.—This temperament is dependent on a large development of the brain and nervous system, and when strong or pure, is marked by angular points in the body and sharpness of features, large head, small bones and muscles, and generally delicate features, as represented in fig. 140.

The Sanguine Temperament.—The sanguine, or *arterial* tem-

perament of some authors, depends on a large development of the circulating system, more especially the lungs and arteries. Its signs are broad shoulders, an animated, lively countenance, florid complexion, blue eyes, sandy, yellowish, or brown hair, and a smooth, harmonious combination of the general form and features, as seen in fig. 141.

Fig. 142.



BILIOUS TEMPERAMENT.

Fig. 143.

LYMPHATIC TEMPERAMENT.

BILIOUS TEMPERAMENT.—The bilious, sometimes called *nervous* temperament, is produced by the structural preponderance of the bones, muscles, and veins. It is known by large, full muscles, prominent, swelling veins, dark hair and eyes, dark, brown, or yellow complexion, as in fig. 142.

LYMPHATIC TEMPERAMENT.—The lymphatic, or *digestive* temperament, is occasioned by the large development of the abdominal viscera, particularly the digestive organs It is denoted by a general rotundity or fullness of the body, dull, pale appearance of the skin, and a disposition somewhat inclining to indolence. It is represented in fig. 143.

The several temperaments are combined in all conceivable proportions, but are seldom so perfectly balanced that one or two will not prevail over the others, and give a manifest direction to the individual character. Black hair and eyes, red cheeks, and a yellowish neck, indicate an equal combination of the sanguine and bilious; sharp features

red cheeks, thin flesh, light hair, and blue eyes, indicate a balance between the sanguine and nervous; sharp features, with a lean body and a dark complexion, indicate a balance between the nervous and bilious; and heavy, round form and features, with a dark complexion, denote a combination nearly equal between the bilious and lymphatic.

CHAPTER VI.

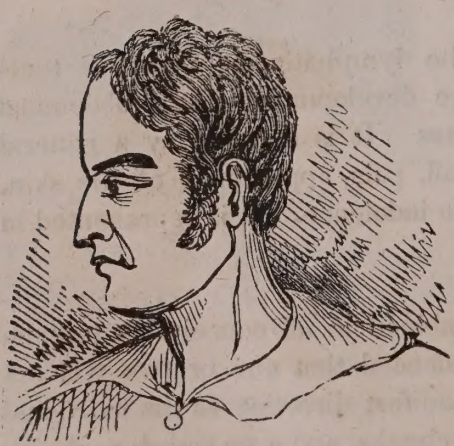
RACES OF MEN.

The division of the human family into races or classes, each distinguished by certain striking peculiarities in the shape of the head, and in the structure, color, and arrangement of the skin, hair, and eyes, though strictly belonging to the science of ethnology, is a subject constantly becoming more interesting to the physiologist, from its intimate connection with the development of men, and the improvement and advancement of humanity.

A classification of mankind into leading classes must of course involve distinctions purely arbitrary; for the races may be distinguished into two or twenty, or any number between, as the marks of difference are more or less prominent.

The division of Blumenbach, who makes five principal races, is as useful and satisfactory as any other can be. These are named the *Caucasian*, *Mongolian*, *Ethiopic*, *American*, and *Malay*.

Fig. 144.



CAUCASIAN RACE

The Caucasian Race.—The Caucasian race is remarkable for the highest physiological development, personal symmetry and beauty, and intellectual attainments. The chief families of this race are the *Caucasians proper*, and the *Germanic*, *Celtic*, *Arabian*, *Libyan*, *Nilotic*, and *Hindostanic* branches.

In this race the skin is generally fair, the hair fine and long, and of various colors, the skull large, rounded, and oval, and the forehead broad or prominent, large and elevated

The face is relatively small and well-proportioned, the nose arched, the chin full, and the teeth vertical.

In this variety or race of men we find the farthest remove from the animal in brain, features, and hair, with a superiority of intellectual and moral power, love of the arts, science, and poetry. The progress of the human family seems to be made wholly through this race.

THE MONGOLIAN RACE.—The Mongolian variety includes the *Mongol Tartars*, *Turks*, and the *Chinese* and *Polar* tribes, which inhabit a vast extent of the earth's surface, and constitute about half of the population of the globe. In physiological characteristics the Mongolians manifest considerable variety. The hair is black, long, and straight, the beard scanty, the skin commonly of an olive tint, the eyes black, the nose broad and short, the cheek-bones broad and flat, the skull oblong, but flattened so as to give it a square appearance, and the forehead low.

Fig. 145.

MONGOLIAN RACE.

In moral development this race is decidedly inferior; their intellectual powers are more imitative than inventive, and they possess but little strength and originality of mind.

THE ETHIOPIC RACE.—The *Negroes of Central Africa*, the *Caffres* and *Hottentots of South Africa*, the *Natives of Australia*, and the *Islanders of the Indian Archipelago and the Pacific Ocean*, constitute the principal families of the Ethiopic or black race.

The black variety of mankind have complexions of jetty hue, black, woolly hair, eyes large, black, and prominent, nose broad and flat, thick lips, and wide mouth. The head is long from the ears back, and narrow; the forehead is low, narrow, and retreating; the cheek-bones prominent, the jaws and teeth projecting, and the chin small. A long, protruding heel, and a flat shin-bone, often distinguish this variety.

Fig. 146.

ETHIOPIC OR BLACK RACE.

In disposition they are easy, indolent, cheerful, fond of sensual pleasure, and lovers of children, fond of gaudy

show, but very improvident. In intellect the race varies much, but the majority of its tribes are low in this respect. There are, however many instances in which individuals of this race have exhibited respectable talent.

The American Race.—The *Indian tribes*, or "*Red men*," who once occupied originally nearly the whole of *North* and *South America*, south of the sixtieth degree of north latitude, constitute this variety.

Fig. 147.

AMERICAN RACE.

The people of this race vary considerably in complexion, but are mostly of a reddish-brown color. The hair is long, straight, and black, the beard deficient, the eyes black and deep set, brows prominent, forehead receding, prominent aquiline nose, high cheek-bones, small skull, rising high at the crown, and the back part flat, large mouth, hard, rough features, with fine, straight, symmetrical frames. They are averse to cultivation, and slow in acquiring knowledge, sedate, proud, restless, sly, revengeful, fond of war, and wholly destitute of maritime adventure, and are rapidly disappearing from the earth before the all-conquering march of the Caucasian.

The Malay Race.—This variety of the human family inhabit *Borneo*, *Java*, the *Phillipine Islands*, *New Zealand*, the *Polynesian Islands*, and a part of *Madagascar*.

Fig. 148.

MALAY RACE

The Malays have tawny or dark brown skins, coarse, black hair, large mouth, broad, short noses, seeming as if broken at the root, projecting upper jaws, and protruding teeth. The forehead is broad and low, the crown of the head high. The moral character of the Malays is of an inferior order. They are active, ingenious, and fond of maritime pursuits, and exhibit considerable intellectual capacity. Yet this race is constantly giving way before European civilization, and has already disappeared from New Holland and Van Diemen's Land

If the opinion is correct that the stronger race continually overgrows all the rest, and gradually obliterates them from the earth, the Caucasians are surely destined eventually to "possess the land." The history of the whole human race thus far indicates that such is the order of nature.

ORIGIN OF THE RACES.—Whether the various races of men have each had separate origins, or whether they are descendants of a common pair, modified by habits of life, climate, and external conditions, my limits will not permit me to discuss. Dr. Pritchard, after a labored investigation, came to the conclusion of the original *unity* of the races of the human family. Other authors have examined the subject apparently as critically, and settled down upon the opinion of the original *diversity* of the races.

Dr. Carpenter remarks: "It is a question of great scientific interest, as well as one that considerably affects the mode in which we treat the races that differ from our own, whether they are all of *one* species, that is, descended from the *same* or from *similar* parentage, or whether they are to be regarded as *distinct species*, the first parents of the several races having had the same differences among themselves as those now exhibited by their descendants."

No doubt the question of the natural inferiority of a race or tribe of the family of mankind really *does* affect the manner in which they are dealt with by their superiors, and materially modifies the state of their consciences in relation to the use or abuse of the weaker by the stronger, still this might makes no right, nor does this question furnish any reason why the more powerful race should maltreat the more feeble. I admit that the process of extermination is going on, according to the irreversible laws of nature, from the highest human being to the lowest animal. I believe that the stronger animals will exterminate the weaker, that man will eventually run out of existence the stronger animals, and that the superior tribe of the human family will finally obliterate all traces of the existence of all the others; still I cannot see in the operations of this law any reason for oppressing, or even for not striving for the development of all men, yes, of all animals, according to their capacities and conditions. So long as inferior men *do* exist, our duty to them is plain enough. No one pretends that we, the stronger, have any right to rid the earth of their presence by violence, or in any other way except that "ordained by Heaven." So far as Nature is concerned, she will see that her laws on the subject are faithfully executed, without our special interference. As far as the feebler races are capable of development and improvement, they are entitled

to the same consideration as those who are more highly endowed in organization.

Theory of Population.—Philosophers have not yet been able to agree upon any satisfactory theory of population. Mr. Malthus has contended that population has a tendency to increase faster than the means of subsistence, unless some extraordinary counteracting causes be interposed. On this assumption, "war, pestilence, and famine," may be hailed as special Godsends to keep the race down to the level of the means of subsistence; but it places the Creator in an attitude from which our reason revolts. Mr. Doubleday, on the other hand, has lately met the positions of Mr. Malthus with an opposite theory. He has undertaken to show that poverty is the principal cause of a rapid increase, and that a good degree of the comforts of life "deadens the principle of increase." He sustains the first clause of his proposition by adverting to the fact that poor folks have the most children, and the latter part by quoting the well-known historical data, that wealthy and luxurious families frequently run out, as have done wealthy and luxurious nations. The doctrines of both of these gentlemen are too narrow and superficial.

Great wealth and extreme poverty are equally in violation of the "natural constitution of man." That God who fashioned the earth, made it capable of yielding sustenance enough for all the beings created in His own image. If men have got at variance with themselves, and warred upon each other; if some have usurped too much of the domain of our common mother, Earth, and others have not where to lay their heads; if men have deranged their proper social relations, perverted the laws of their own organization, and entailed upon themselves and society innumerable *permitted* evils, let us pause long before we charge all these results to special providences or natural tendencies.

The actual productiveness of the earth is incredible to those who have never examined the subject. Under the best systems of agriculture and dietetics, Ireland, where now eight millions of human beings starve, could healthfully sustain one hundred millions, and the soil of the United States is capable of producing more than food enough for all the inhabitants now existing on the globe.

PART III.

HYGIENE.

The hygienic agencies—absurdly called "non-naturals" in medical books—comprise the whole and ample materia medica of the true hydropath. They are *air*, *light*, *water*, *food*, *temperature*, *exercise*, *sleep*, *clothing*, and the *passions*. These agencies, variously modified and intensified, I believe, are capable of producing all the really remedial effects in all diseases which the whole pharmacopœia of allopathy, with its thousand drugs and destructives, can produce, and without any of the evil or injurious results always attendant upon the operation of the latter; while to sustain the vital machinery in its most vigorous and enduring condition, in other words, to preserve health, we have but to employ or apply them according to established and invariable laws.

In claiming for those agencies by which every part and organ of every living animal and vegetable in existence is nourished, built up, sustained, and finally changed and decomposed, by which the integrity of every structure and function is maintained during life, and resolved into its primitive elements and conditions on the cessation of the life-principle, a complete and perfect materia medica, I mean as far as regards functional derangement, which, indeed, constitutes ninety-nine-hundredths of the diseases of society. Mechanical injuries, displacements of parts, organic lesions, etc., coming appropriately under the management of the surgeon, may and often do require mechanical agencies of some sort.

I am aware that few practicing hydropaths take this *ultra* ground. Some of them administer anodynes occasionally; some bleed now and then; some call in the aid of blue pill and cathartic potions under particular circumstances; others give a little brandy on emergencies, on the absurd notion of "keeping up the vital powers till *nature has time to rally*;" and others deal out "a little homeopathy" ever and anon. I am most thoroughly convinced that all of these "auxiliaries" are unnecessary; most of them much worse than useless. Their apparent

necessity, I contend, has its source in the *ignorance* of the practitioner. He does not fully understand the philosophy of vitality, the intrinsic character of disease, nor the scope and power of these hygienic agencies, if he regards them as at fault or insufficient. I grant that occasional dosing may be the best some hydropaths can do. I consider him justifiable in acting according to his understanding. It may happen, too, that he has not all the appliances of hydropathy at command, or the patient will not submit to them. Under such circumstances I do not say that it is not expedient to give drugs. But I do maintain that a full knowledge of all the remedial resources of hygiene, with the possession of all the means afforded by such knowledge, enables the hydropath to dispense with drug medication entirely.

I have known and carefully noted the particulars of many cases where the professed hydropath has resorted to drugging, or bleeding, or external irritants, and in every such case there was manifest ignorance or error in the management of water, diet, exercise, sleep, temperature, or of the voluntary habits, or in relation to some other hygienic agent or condition. I have known some patients, while under judicious water-treatment, in their impatience to force nature a little faster than she was willing to go of her own accord, dose themselves now and then with stimulants, bitters, herb teas, nervines, or laxatives, and whatever seeming advantage immediately resulted, I have always found, as far as I have been able to "compare notes," that those who did nothing of the kind, other circumstances being equal, would get the best health in the end.

CHAPTER I.

OF AIR.

VITAL PROPERTY OF AIR.—The physiology of the respiratory function explains the relation of an abundant supply of pure fresh air to the maintenance of health and the attainment of longevity. Fresh air in the lungs is so immediately essential to life that most animals, in less than one minute, when deprived of it, suffocate, become unconscious, and appear to be dead, real death occurring in a few minutes if air is not supplied.

Oxygen, which has been called "vital air," is undoubtedly the vivifying principle of the atmosphere. Carbon, nitrogen, and hydrogen are

generally considered *poisonous* in relation to the lungs, but they are rather negative than positive agents, being merely incapable of supporting respiration. When persons or animals are confined in a close room, they continue to breathe until the oxygen of the enclosed air is exhausted, when death inevitably results. The flame of a lamp or candle will also expire when the oxygen is consumed, this gas being as essential to combustion as to respiration. In dry wells, deep vaults, and other situations where carbonic acid gas, or other irrespirable airs, are liable to accumulate, the introduction of a lighted taper is an important precaution. If the flame be extinguished, it would be dangerous to life to enter, for breathing cannot take place where combustion ceases. Carbonic acid gas, being heavier than common atmospheric air, settles to the bottom of a pit or room, while nitrogen and hydrogen, being lighter, ascend to the top; therefore in a room vitiated by a large collection of persons, or from want of ventilation, the purest air is found in the middle of the apartment. A dog has been suffocated by carbonic acid gas in a room where a man, standing erect, felt no inconvenience.

Quantity of Respired Air.—Physiologists reckon that an adequate supply of air for an ordinary man to breathe each minute is from seven to ten cubic feet. A hundred persons confined in a room thirty feet in length, breadth, and height, containing nearly 30,000 cubic feet, would render the whole air unfit for respiration in about five hours. Imperfect ventilation, therefore, in crowded assemblies, churches, school-rooms, theatres, factories, and workshops, especially in the evening, when many lamps or gas-burners are employed, is a common source of debility and disease. An ordinary gas-burner consumes as much oxygen as four adult persons; but the loss of oxygen is not alone the cause of injury resulting from large gatherings of people in ill-ventilated places, for the irrespirable air thrown out from the lungs is rendered still more noxious by the exhalations from the skin.

The artificial habit of lessening the breathing capacity by means of stays, corsets, and tight dresses, is now happily passing away, although the wasp-like waists which deform so many of the gentler sex still *adorn* the "fashion plates" of the magazines, and caricature the female form in most of the fashionable shop-windows. Could the women of America—I say nothing of *ladies*—fully appreciate the importance of dress as connnected with respiration, and the relation of this function to their own health and happiness and the welfare of their offspring, the monthly importation of Parisian cuts, turns, twists, fits and misfits, would soon be substituted by "short dresses," *loose* as well as short, or something in the way of clothing that would emancipate the lungs

Fig. 149.

NATURAL WAIST.

from oppression "most foul, strange, and unnatural." A reform in female dress would not only set free the breathing apparatus, but would confer an incalculable benefit on the human race in another respect. It would enable the wealthy classes to devote more attention to more useful subjects, and think less of the frivolities of ever-changing and never satisfying fashions; and diminish the demand upon the kind of work—sewing by day and by night—which is now ruining the constitutions of thousands of poor and industrious females, and sending them rapidly to premature graves.

Fig. 149 is a representation of the female chest in the natural state, unconstrained in the least by the clothing. The person who fails to discover the ease, grace, beauty, and symmetry of the figure as contrasted with that of a modern belle, must have a taste as artificial as any mantua-maker could desire. It is perfectly certain that, just to the extent that any female diminishes the circumference of the body around the lungs, just in that ratio will she lessen the number of her days, provided she does not die of violence or disease, which is a hazard she must also encounter.

Fig. 150.

UNNATURAL WAIST.

Observe the stiff, constrained, uncomfortable, and uncomely appearance of a fashionable lady (fig. 150). It is really painful to look upon such a self-constituted burlesque on humanity.

If there are any young ladies whose excess of approbativeness induces them to strain, and labor, and suffer, to produce "small tapering waists," so as to look "delicately fashionable," or "fashionably delicate," for the purpose of attracting the admiration of the other sex, let me assure them that they are destined to a sad failure. Notice they may, indeed, obtain, but admiration in that way, never. I have never heard a young man speak of the habit except in terms of ridicule; and I have never heard any man speak of it except in language of reprobation for its manifestly injurious consequences, and contempt for its ridiculous appearance.

The contrast appears still stronger when the diminutive circle of the waist which beautifies the belle is placed by the side of the broad, expanded chest, which renders the woman vigorous and healthy, and consequently a help *meet* for man—fig. 151. Such was the model of female beauty ere sacrilegious hands had marred its fair proportions, and wherever, among the inhabitants of all parts of the earth, we find long-lived mothers and grandmothers, we are sure to find full, round chests and capacious lungs.

Fig. 151.

VENUS DE MEDICIS.

Purity of Respired Air.—Equal in importance with the quantity of the air we breathe is its purity. It is melancholy to reflect on the hard necessity which compels multitudes to live, or rather stay, in the sweltering garrets and infectious cellars of cities, or on the cupidity of landlords who provide such tenements, or on that dereliction of duty in municipal authorities which permits their existence. Much of the evil, however, *may* have its source in ignorance.

Few sanatory circumstances are less regarded than those nuisances which fill the air with noxious effluvia. I know of no reason why Boston and Philadelphia should be more healthy than New York, unless it is because the air of Boston is not continually filled with the poison of *tobacco smoke*, and the Philadelphians have little or no *underground population*. In every hygienic aspect, New York is the favored locality. It is true New York suffers a large influx of foreigners, the fatality among whom considerably swells its bill of mortality. But this alone, viewed in connection with its superior advantage in position, does not account for the difference, for according to the statistics of the present year, the mortality of New York is twenty-five per cent. greater than that of Philadelphia, and twelve and a half per cent. greater than that of Boston; equal, in fact, to New Orleans and other southern cities usually regarded as sickly.

Nearly all cities—New York especially—are full of air-infecting nuisances, not as generally diffused as tobacco smoke, but as intensely poisonous in certain localities, as distilleries, cow stables, swill-milk factories, hog-pens, soap factories, slaughter-houses, bone-boiling establishments, tallow-melting places, graveyards, etc., from which are constantly emanating streams of contagion and death. I do not believe

there is a single city on earth, certainly not in the United States, where the people would endure or tolerate these pestilences, were they fully enlightened on the subject.

It is utterly impossible for the lungs to be fully expanded in a very impure atmosphere, because the air passages, irritated by the extraneous particles, spasmodically contract to keep them out. The consequence of this is, those persons who reside permanently in an atmosphere charged with foreign ingredients or miasms, find their lungs continually contracting, unless this tendency is counteracted by a constant vocal or muscular exercise calculated to invigorate the whole respiratory apparatus and expand the chest.

CHANGE OF AIR.—The remarkable benefits frequently experienced when the inhabitants of crowded, dusty cities rusticate in the country for a few days, or when invalids exercise themselves in traveling, and amuse themselves with a variety of new scenery, has caused some physiologists, who have a reputation for considerable intelligence, to imagine that the advantage was in the *change* itself more than in the better quality of the country air. It is quite a prevalent notion that human beings require changes of food, drink, and air, merely as changes. Such notions have no foundation in philosophy. If the food, or drink, or air, or all, is physiologically the *best*, it can never be improved by any change during the whole period of life; but if in any respect it is imperfect, a change to a better quality would be beneficial. Dr. Dunglison, who is a standard author in the profession on hygienic matters, thinks there is so much virtue in "modifications of different atmospheric influences," that a change from a *better* to a *worse* air is better than no change at all. His language is (Elements of Hygiene, page 125): "The change from a better to a worse air has even been found serviceable. In Edinburgh, the inhabitants of the most airy parts of the New Town frequently send their children, when laboring under hooping-cough, to the Cowgate, a filthy street, which runs at right angles under one of the largest thoroughfares in the Old Town, and in which, at a certain hour of the night, the inhabitants eject all the offensive accumulations from their houses, to be washed away by the water of the reservoirs, let on for the purpose." It is passing strange that any medical man of the present day, of high rank and acknowledged authority in his profession, should be so blinded by false theories as to commend a custom so abominable, simply because some ignorant persons were foolish enough to practice it!

POSITIONS AND HABITS AFFECTING RESPIRATION.—Sedentary

habits, unless frequently alternated with vigorous and prolonged exercise, weaken the abdominal muscles, and thereby lessen the activity of the breathing process.

Intense mental application, if long-continued, powerfully diminishes the respiratory function. No person in deep thought, with the brain laboring at its utmost capacity, breathes deep and free; hence editors, particularly those who are closely confined to their sanctums, are proverbially short-lived. Many of them are worked to death in five or six years, who, had they attended properly to their respiratory functions, both pulmonary and cutaneous, could have held out, under the same amount of labor, three or four times as long. All very studious persons, especially those given to abstruse investigations—the exercise of the reflective intellect—should never fail to exercise the whole body daily, and the arms, shoulders, and abdominal muscles several times a day. Riding on horseback, climbing mountains, running up and down stairs, dancing the tight rope, swinging on the hand ladder, throwing the dumb bells or grace hoops, playing ball, bowling, sawing wood, planing boards, etc., are examples of appropriate exercises. Rotary motions, with both arms extended, making the hands simultaneously describe as large a circle as possible, striking the elbows or backs of the hands together behind the back, or attempting so to do, are excellent exercises when the person is stoop-shouldered, and the chest contracted from malformation or by artificial means.

All crooked or constrained bodily positions affect respiration injuriously. Reading, writing, sitting, standing, speaking, or laboring, with the trunk of the body bent forward, is extremely hurtful, by overstretching the muscles of the back, compressing the lungs, and pushing downward and backward the stomach, bowels, and abdominal muscles. In all mechanical or manual labor occupations, the body should always be bent, or *lean*, on the hip joints; the trunk should always be kept "as straight as an Indian."

Catching Cold.—The general misapprehension in regard to the theory of "catching cold," frequently produces the very evil that is most feared. More colds are taken in overheated than in too cold places, and still more are owing to vitiated air. "Backwoodsmen," who sleep all winter long in shanties through which the snow-flakes pass freely, are seldom troubled with what are called "colds and coughs." Too close confinement to hot air in ill-ventilated rooms renders the body preternaturally susceptible to atmospheric changes. Infants and young children are generally badly managed in this respect in this country. They are often made sickly, puny, peevish, and effeminate.

by keeping the doors and windows too close, and the sufferer too much in doors, as though the breath of heaven was unfriendly to human life.

Purifying the Air.—There is one method of purifying the air which is accessible to all persons in all places. In sleeping and other apartments, where thorough ventilation is impossible, the air may be rapidly changed and materially freshened by opening all the doors and windows, and then swinging one door violently forward and backward. It is a good, indeed a necessary practice in the cases of invalids who occupy close and secluded rooms, and who are unable to walk out.

Sleeping Rooms.—Sleeping rooms are generally miserably ventilated. Air of a pure quality, and abundant in quantity, is much more important during our sleeping than in our waking hours; but the common habits of the people are to provide large, spacious eating and sitting rooms, and small, close sleeping apartments. No one should sleep in a room, in summer or in winter, with all the windows and doors tightly closed. Windows can at all times be opened more or less at the bottom or top, or the door placed a little ajar, so as to permit the ingress of fresh air, without admitting any injurious current. I have known invalids with bronchitis, consumption, and other diseases, in this city of a thousand intelligent physicians, suffer horribly, by being confined in a close, sultry room, in a hot July day, *per advice of the doctor!*

Bed-curtains are rather worse than a useless appendage. If used at all, they should never be drawn tightly around the bed. The head should never be raised very high during sleep, as that position oppresses the lungs; nor should the sleeper incline toward the face, with the shoulders thrown forward. A late supper, by filling the stomach, prevents, in the horizontal posture, the descent of the diaphragm, hinders free breathing, and induces congestion of the brain, dreaming, nightmare, etc.

Stoves and Fireplaces.—Grates and fireplaces secure a much better ventilation than stoves of any description. Stoves are regarded by some as constituting "the great nuisance of America;" and there is no question that, as usually managed, they do actually vitiate all the air of the room. Air-tight stoves require the most careful attention to ventilation, and indeed no stove should be used in any place where there is not resource or provision for the free admission of external air.

Lamps, Candles, Gas-Burners, etc.—As all the means by which a room is lighted in the evening are so many methods of consuming

the oxygen, and rendering the air irrespirable, it is wel to bear in mind that the amount of ventilation must have a due relation to the number of lights employed. In small rooms, and in sleeping rooms where a lamp is kept burning through the night, and in rooms occupied by invalids, attention to this circumstance is especially important. In this connection I will allude to another very common source of vitiated air—*smoky lamps*. It may astonish those who have never seen this evil, to be told that persons can have their organs of sense so dulled and torpified as to sit a whole evening in a room with two or three oil lamps, each sending up a column of black smoke, and filling the room with a rank, suffocating odor, and yet not appear to be the least offended or incommoded. Yet such things are not uncommon in our cities; and many who work evenings by the light of smoky lamps, often get weak eyes as well as impure blood as the result.

Public Conveyances.—It may be traveling a little out of the record, for me to speak of the bad air of steamboats, railroad cars, stages, omnibuses, and other conveyances; but being a constant sufferer from this source, I may perhaps be justifiable in glancing at it, especially as it is a public evil as well as a private grievance. It would seem at first thought that any method of passing through the air at the rate of fifteen or twenty miles an hour, ought to secure the passenger fresh air in abundance. The theory is beautiful, but it fails in practice. Wherever we go, the tobacco-nuisance follows us. We feel its narcotic miasm rank in every street of the city, and if we go into the country it goes with us. To be sure, "No smoking abaft the wheels," is conspicuously displayed on the Sound and River steamers; "No smoking inside the cars," is said or intended on the cars; while on the numerous ferry-boats conveying constant streams of people to and from the great emporium, it is gently intimated, "*Gentlemen* are particularly requested not to smoke on *this side* of the boat;" still it always happens that the evidence of smoking pervades every part of the boat or car. Those who stand outside of the not-to-be-smoked-in apartment, around the gangways, on the platform, and at either end, contrive in some way or other to make the whole company smell the weed, whether they will or no. And in the stages and omnibuses no one thinks of smoking inside without permission, but the driver, and one or two puffers on his seat, can easily give the passengers a "comfortable smoke," particularly uncomfortable to some if the wind be against them.

There is yet another evil which ought to be remedied. There is usually in omnibuses, stages, and railroad cars, a few persons who ca-

not, or think they cannot, bear fresh air, when the weather is cool or damp. To suit their whim, all the windows are closed, and the company perhaps for an hour or two sit inhaling over and over again the confined air, all the while becoming more vitiated. The rules of ventilation apply to all rooms and apartments alike, whether in dwelling-houses or traveling vehicles

CHAPTER II.

OF LIGHT.

Relation of Light to Organization.—The hygienic importance of light is not sufficiently understood by the people, nor its remedial influence sufficiently regarded by physicians. Whether it be a distinct imponderable entity, a property of electricity, or something else, it would be idle here to speculate; but it is certain that the light which this earth derives from the sun and the fixed stars, has a powerfully modifying influence on all the functions of its animal and vegetable kingdoms.

Some plants thrive best when exposed to strong sunlight, others in a moderate light, and others when considerably shaded, yet all of them, without exception, require a good degree of the influence of light to become hardy, firm, and vigorous. Those which grow in deeply-shaded situations or dark cellars are comparatively colorless, slender, and friable. Light is the cause of color in all bodies; it is entirely reflected by white surfaces, and completely absorbed by black.

Many insects and fishes while living are constantly luminous, in consequence of the rays of light being constantly emitted from various points of their bodies; the fire-fly emits its sparks from two oval spots at the side of the thorax; in the glow-worm a phosphorescent brilliancy issues from its abdominal rings; luminous insects are supposed to absorb light during the day, like the Bononian stone, and impart it in the evening.

Physiological Influences of Light.—Plants absorb carbon, and give out oxygen or vital air in the light; but during the night this process is reversed, so that they absorb oxygen, and give out carbon; hence it is injurious and even dangerous to sleep at night in a situation which is closely surrounded with dense foliage, and not well ventilated.

The nutritive process is materially checked in all vegetables and animals when deprived of light for a considerable time; in this case vegetables are said to become *etiolated*, a condition analogous to that called *anæmia*, or *hypæmia*, in man—a state of debility, bloodlessness, and inanition. In some of the lower animals the process of metamorphosis is arrested by deprivation of the solar influence. The tadpole, for example, instead of developing into the frog, either continues to grow as a tadpole, or degenerates into some kind of monstrosity; and the specimens of human monstrosities, developed abnormally, in consequence of the absence of a due degree of "Heaven's first-born," are neither few nor far between in the underground tenements of large cities.

The operation of light on the animal organism has always been recognized as urging to exercise, and increasing the activity of both the bodily and mental powers; while its absence or privation disposes to indolence and obesity. Animals are more readily fattened when kept in obscurity, because the diminished activity of the depurating functions favors the accumulation of adipose matter. Poultry are often confined in dark places to augment their store of oil; and the heads of geese and turkeys are sometimes covered by a hood, or their eyes put out, in order to procure from them fat and greasy livers, as choice morsels for depraved epicures.

Almost the entire population of our large cities, who occupy back-rooms and rear buildings where the sun never shines, and cellars and vaults below the level of the ground on the shaded side of narrow streets, is more or less diseased. Of those who do not die of acute diseases, a majority exhibit unmistakable marks of imperfect development and deficient vitality; and, in fact, as with animals and vegetables in like circumstances, often run into deformities and monstrosities, not more reproachful, however, to those parents who propagate under such disadvantages, than disgraceful to that city, state, or national government which either *compels* or *permits* any class of its citizens to live in such abodes.

These facts show us that light, and an abundant supply of it, is indispensable to a due development of all organized bodies.

THERAPEUTIC CONSIDERATIONS.—Medical men have always noticed that diseases of all kinds, from the most trifling toothache, quinsy, or rheumatism, to the severest attack of fever, scrofula, or consumption, are much less manageable in low, dark apartments. And it is notorious that, during the prevalence of epidemics, as the cholera, the shaded side of a narrow street invariably exhibits the greatest ratio of fatal cases.

"The observations of Dr. Edwards, on the influence of light in promoting the perfect development of animals, led him to conclude that in climates where nudity is not incompatible with health, exposure of the whole surface of the body to light is favorable to the regular conformation of the body; and he, therefore, has suggested insolation in the open air as a means calculated to restore healthy conformation to children affected with scrofula, whose leviations of form do not appear to be incurable."

Pereira says: "As in bright solar light we feel more active, cheerful, and happy, while obscurity and darkness give rise to a gloomy and depressed condition of mind, so we employ isolation in the open air as a mental stimulus in melancholy, lowness of spirits, and despondency."

Sanatory Inferences.—The inferences deducible from the foregoing considerations are sufficiently obvious. All persons, in order to acquire and maintain the best condition of health and strength, should be frequently exposed to the light of the sun, except when oppressively hot. Children are generally maltreated, more especially in cities, in being kept almost entirely excluded from sunshine. Many good mothers are more fond of the delicate faces and pale complexions of their little ones, than intelligent in relation to their physiological welfare. A little sun-browning occasionally of their faces, necks, hands, and feet, and, finally, of their whole bodies, would not only render their development more perfect and enduring, but tend to the production of the greatest symmetry and beauty in manhood and womanhood. Parents should not be too careful in putting umbrella-hats and bonnet-sunshades on the heads of their children every time they run out of doors.

Almost all persons, young or old, who live in cities, can invigorate the skin and improve the general health, by frequent exposures of the whole body to the air of a well-lighted room, applying moderate friction to the surface at the same time. Light as well as air is generally excluded from the surface by too much or too tight clothing, which evil such exposures in some degree would counteract.

Dwelling-houses ought to be constructed with especial reference to light. Those rooms which are most occupied should be the best lighted, as the kitchen and sitting-room. The sun should be allowed free access to the yard and out-grounds. Shade-trees and shrubbery, useful to some extent around the dwelling, should never be so thick as to shut the direct rays of the sun out entirely. The influence of light in dissipating and decomposing noxious vapors and deleterious gases, which collect in and around low grounds and dark places, is very great.

The sudden exhilaration and invigoration experienced by the pent-up denizens of our large towns, when they go from their dim counting-rooms, gloomy offices, and basement workshops, to rusticate a few days in mountainous regions, is due nearly as much to the greater strength of the natural light as to the greater purity of the air.

CHAPTER III.

OF DRINK.

NATURE'S BEVERAGE.—Nature has provided no other drink for man, nor for animals, nor for vegetables, than *pure water;* and no animal but man seeks any other either as a beverage or as medicine. Its value as a beverage is in all cases in proportion to its purity. In plants water is employed as a vehicle to convey the nutrient elements absorbed by the roots throughout their various structures. In animals provided with a stomach for receiving aliment, it is the medium by which the materials of nutrition are conveyed to all parts of the body, and the waste matters carried away. Milk, which constitutes the principal food of the young mammal until the teeth are developed, contains about ninety parts of water in a hundred, and though often employed as a beverage by adults, is properly regarded as food. All the *diluent* preparations, which fill so large a space among medical prescriptions, owe their whole powers of dilution to the water alone.

IS MAN A DRINKING ANIMAL?—The question whether man is by nature a drinking animal, or whether the water required for his organism is sufficiently supplied in his *natural* food, has been raised within the last half century. Dr. Lambe, of England, has very ably argued the negative of the first position named; but the majority of dietetic writers hold the opposite opinion. It is, however, perfectly certain—and the fact has been proved by the direct experiments of Dr. Alcott and others—that those who adopt a regimen exclusively vegetable, and make a large proportion of their food to consist of succulent fruits and watery vegetables, can be healthfully sustained and nourished without water-drinking. It is also certain that those who eat much animal food, use salt, spices, and greasy dishes freely, and who have to employ a large proportion of concentrated farinaceous substances—which is indeed the general plan of the dietary system of civilized society—

require a large amount of water to carry off the saline particles and other impurities, and allay the artificial fever which they produce. In either case the thirst is the safe rule of practice.

Quantity and Times of Water-Drinking.— Writers are remarkably discordant in their notions as to the quantity of water a person should take into the stomach, and also as to the times for taking it. Some think we should drink as little as possible; others are of opinion that we should swallow all we can; one class of writers recommends all drinking to be done between meals, and another class advises us to drink abundantly at meals. It is easy to discover the sources of these discrepancies. Writers are too apt to deduce general inferences from individual peculiarities. What is precisely right for one person may be exactly wrong for another. If the dietetic and other voluntary habits of all people were strictly physiological, we could give them all a rule without exceptions, and the same rule. But the quantity of water useful or necessary depends on all the habits of life, amount of exercise, quality of food, the employment of stimulants, condiments, etc. The kind of occupation also affects the question; for example, a person laboring in a dry, warm atmosphere will require more drink than one working in a cool, moist air.

The amount of water contained in the various alimentary substances in common use, shows the relation which the quantity of the water necessary to employ as drink bears to the kind of food. Thus, in one hundred parts (rejecting fractions) water constitutes, of gum arabic 17 sugar-candy 10, arrow-root 18, wheat 14, rye 16, oats 20, barley 13 maize 18, peas 16, beans 14, lentils 15, potatoes 75, turnips 92, carrots 87, beets 87, artichoke 79, white cabbage 92, black bread 32, beef tea 98, blood 80, fresh lean meat of beef, mutton, veal, pork, deer, chicken, and pigeon 74 to 78, cod, haddock, sole, carp, and trout 79 to 82, ox's liver 68, calf's sweet-bread 70, white of egg 68, yolk of egg 85, cow's milk 87, human do. 87, goat's do. 86, ass's do. 91, ewe's do. 85.

The quantity of water contained in aliments, however, does not determine their nutritive power, for some substances, as butter and hog's lard, contain scarcely any water, yet are capable of supplying the body with much less nourishment than milk, which is about seven eighths water.

As to the best times for drinking, it is not difficult to give a general rule; but people who live variously must vary it accordingly. Unquestionably the best time for water-drinking, as a habit, is when the stomach is entirely empty—on first rising in the morning, and half an hour or an hour before meals Persons who take habitually a tumbler

of pure water at those times, and eat plain food, will seldom experience much thirst; but those who employ thirst-provoking aliments or seasonings should assuage that thirst by water-drinking, even at meals. There are many morbid conditions of the system in which it is advisable to drink freely, even at meals, and without regard to thirst, but these will be more appropriately considered hereafter. One rule, however, of almost universal application for dietetic or remedial purposes is, never to drink, either at meals or at other times, to the extent of producing any decidedly uncomfortable heaviness, distention, or oppression of the stomach. Those who have weakened their digestive powers, and rendered the sensibility of the nervous system morbidly acute by the use of tea, coffee, etc., should accustom the stomach to the impression of cold water gradually, beginning with only a part of a tumbler, and increasing the quantity as the tone of the digestive organs improves.

Temperature of Drink —*Cool*, but not very cold water appears to be most perfectly adapted to all the purposes of the animal economy. Without doubt the human system possesses a wide range of adaptability, and can, provided the general habits are reasonably correct, be very well sustained on water rather warm or very cold. It is well known that in the hot season, particularly in our cities, many laborers die very soon after drinking freely of iced-water. This matter ought to be well understood, for there is surely no necessity for any one to die in this way. It is not the iced-water alone that destroys them, but this proves an exciting cause when the system has been brought into an unfavorable state of vital resistance. I never knew or heard of any person dying or being seriously injured by the free use of iced-water—as free as the thirst demanded—who was temperate and simple in all his eating and drinking habits. All who are fatally injured by drinking iced-water, as far as I have been able to observe, or can learn from others, are among those who use some kinds or combinations of dietetic articles which provoke a great degree of factitious thirst; for example, baker's bread, and butter, stale salted meat, as ham or cod-fish, old cheese, plum-pudding, etc. Of course such persons feel a necessity for drinking freely, and as iced-water seems a grateful antidote to the feverishness artificially produced in the stomach, they are apt to indulge injuriously. There is no safety for such persons, except in either eating wholesome food, which does not provoke thirst, or in drinking water of a moderate temperature. But the great danger is with those who, in addition to the bad diet just mentioned, add the poison of intoxicating drinks. In fact, very few die in consequence of

drinking cold water in hot weather, except those more or less addicted to alcoholic stimulants—probably not more than one in ten. The tendency of all forms of alcoholized beverages—from soft wines and ales to small beers and porters, and from hard ciders and rough brandies to harsh rums and strong gins—is to weaken and paralyze the nerves of the stomach; and when these exhausted nerves are suddenly chilled by a large draught of cold water, it is not wonderful that reaction does not take place, nor that death ensues.

Artificial Drinks.—Under this head I purpose to speak briefly of a variety of made-up drinks, some of which are intended as luxuries, others as medicines. "Ardent spirits, malt liquors, wine and cider," specially anathematized by name and nature, and deservedly excommunicated from use and fellowship by the total abstinence societies, I need not dwell upon. They are poisons, in every sense inimical to the human constitution; in fact, deleterious to every organized thing in existence, and are produced *only* from the decay, destruction, and decomposition of the products of organized matters. They deserve commemoration only for the mischiefs they have done, and execration only for the miseries they are now inflicting on human society I cannot, however, refrain from uttering a word of lamentation in this place, and expressing my regret and astonishment that there should be any found in this enlightened day and country, and among the leaders of mankind, especially among medical gentlemen and Christian ministers, who profess to guide the body to health and the soul to heaven—who *profess* to take true science and the Bible as *their* guides, yet who not only indulge in the intoxicating bowl themselves, but even commend it to their fellow-creatures! Surely the number of clergymen who have fallen from their pulpits in consequence of misinterpreting Paul's advice to Timothy, and the number of physicians who have filled drunkard's graves, ought to admonish *them* that "wine is a mocker, and strong drink is raging."

Tea possesses strong nervine and moderate narcotic properties, and considerable astringency, due to the presence of tannin. All the properties of tea are subject to much variation. Usually the green teas possess more astringency than the black; they are also, as found in our markets, to a great extent adulterated with coloring matter, commonly Prussian blue. The less injurious effects of black teas evidently depend on their purer quality and weaker strength, as a concentrated extract of either is powerfully and equally poisonous. It is amusing to read the conflicting testimonies of medical authors respecting the operative effects of tea as a beverage, and we sometimes

find conflicting opinions expressed by the same author. Thus says Pereira: "Strong green tea produces on some constitutions, usually those popularly known as nervous, very severe effects. It gives rise to tremor, anxiety, sleeplessness, and most distressing feelings. On others, however, none of these symptoms are manifested. Part of the ill effects sometimes ascribed to tea may be owing to the use of so much aqueous liquid, to the temperature of the liquid, to milk and sugar used with it, or to the action of tannin on the digestive liquid. But, independently of these, tea possesses a specific and marked influence over the functions of the brain, not referable to any of the circumstances just alluded to. The influence of tea, especially the green variety, over the nervous system, is analogous in some respects to that of foxglove, for both green tea and foxglove occasion watchfulness, and act as sedatives on the heart and blood-vessels."

This appears to read plain enough, but in the next preceding paragraph the same author has told us. "Notwithstanding the extensive employment of tea in this country, it is no easy matter to ascertain its precise effect on the constitution."

Professor C. A. Lee, of this city, says: "A very strong decoction of *green* tea, or the extract, speedily destroys life in the inferior animals, even when given in very small doses. The strongly-marked effects of tea upon persons of a highly nervous temperament, in causing wakefulness, tremors, palpitations, and other distressing feelings, prove also that it is an agent of considerable power, and should not be used to any *great extent* by persons of *such a habit*. It not unfrequently occasions vertigo and sick headache, together with a sinking sensation at the pit of the stomach shortly after eating. It is also opposed to an active nutrition, and should, therefore, be used with great moderation by those who are very thin in flesh."

These facts are useful to us, but the medical prescription can be greatly improved upon. If the *extreme* effects of tea are manifested by the *susceptible* constitutions, the principle is clear enough that all constitutions suffer from it, though in a less degree. Instead of recommending "nervous" and "thin" persons to use it with *moderation*, the true physician, who values truth too highly to compromise it with false customs, will advise its total disuse.

Schwaan found by experiment that tannin, when mixed with artificial digestive liquids, threw down a precipitate, and rendered the fluids inert. The effect of the tannin upon the gastric juice may account in part for its influence in promoting indigestion.

It is certain that females, on account of their in-door occupations and more sedentary habits, suffer incomparably more from this, their

favorite beverage, than males do; and I am inclined to think that the hot water is nearly or quite as deleterious as the herb, as the infusion is usually drank. From a pretty close observation, too, I am fully satisfied that the general prevalence of "female weaknesses"—a phrase including an extensive and formidable class of ailments—are in a great measure attributable to *warm teas*.

Almost every kind of herb that grows, except those which are really nutritious, or are violently poisonous to the stomach and bowels, preternaturally excites the action of the kidneys and urinary organs; or, to speak more physiologically, the kidneys are the excretory organs intended to throw off a great part of such foreign or waste material as is contained in infusions and decoctions of herbs. Very warm drinks are in themselves debilitating to the stomach, but the addition of the properties of the tea or other herb burdens the kidneys and urinary apparatus with an unnatural amount of labor continually. These organs, kept constantly over-excited, must become debilitated, and preternaturally irritable; and this condition of debility and irritability extends sympathetically to all the surrounding viscera; finally, the abominal muscles themselves become relaxed, and, with the general nervous exhaustion produced by the active nervine and narcotic properties of the tea throughout the system, a foundation is laid for the whole train of maladies, displacements of organs, and disordered functions, which are so general among females of the present day.

The history of these complaints, and the history of artificial beverages, particularly the employment of hot tea and coffee, show that there has been an intimate connection between the origin, progress, and prevalence of those diseases and these beverages. Fifty or an hundred years ago these complaints were comparatively rare. Mothers in those days did not commence tea-drinking in childhood; their bodies were nearly developed and their constitutions well formed before *their* mothers allowed them to indulge in enervating slops. But now tea-drinking commences sometimes before the period of childhood—in babyhood. I have seen a regular tea-toper in a baby under two years of age. It is very common in these days for children of five and six years of age, little girls especially, to drink their two cups of tea or coffee morning and evening. Is it wonderful that in early youth they are precocious in infirmities, and become chlorotic or cachectic, and complain of spinal irritation, mismenstruation, nervous debility, and a train of local affections wholly unknown in simple or in savage life?

Coffee possesses the same nervine and narcotic properties as tea, without its astringency. It usually acts as a laxative to the bowels for

awhile in those unaccustomed to its use; but its long-continued employment always results in constipation. Its operative effects are, in most persons, rather more exciting and disturbing to the mental and organic functions than those of tea. Most persons who accurately notice their feelings under its influence, find a greater derangement of the digestive functions and the secretion of the liver, than results from the use of tea. From all the testimony I can gather from medical and dietetical writers, coupled with some degree of personal observation, I should judge it to be more directly injurious to the digestive process, and more exhausting to the general nervous energy, than tea, and less injurious to the kidneys and pelvic viscera.

Medical authorities are as self-contradictory in regard to coffee as they are about tea. Pereira says: "Employed moderately, I believe it to be a wholesome and slightly nutritive beverage." But in the same paragraph Pereira continues: "The *immoderate* use of coffee is *said* to produce various nervous disorders, such as anxiety, tremor, disordered vision, palpitation, and feverishness." Professor Lee speaks like a man who loves a good cup of the exhilarating decoction. He says: "We should consider that cordials and stimulants are, at least occasionally, useful, and that, whether useful or not, mankind always have, and probably always will, make use of them. But of all those which have hitherto been introduced, none, perhaps, combine so many excellent with so few evil qualities as that of coffee. To moderately nutritive properties it adds those of a mild and cordial stimulant, without producing those peculiar narcotic effects which so often accompany the use of strong green tea."

The eulogy of Dr. Lee is out-eulogied by Abd-al-Kadir Anasari Djezeri Hanbali, son of Mahommet: "O coffee! thou dispellest the cares of the great; thou bringest back those who wander from the paths of knowledge. Coffee is the beverage of the people of God, and the cordial of His servants who thirst for wisdom. When coffee is infused into the bowl, it exhales the *odor of musk*, and is of the *color of ink*. The truth is not known except to the wise, who drink it from the foaming coffee-cup. God has deprived fools of coffee, who, with invincible obstinacy, condemn it as injurious."

Chocolate, though destitute of the nervine properties of tea and coffee, contains a large proportion of fat or oil, called *butter of cacao*, which is difficult of digestion, and particularly injurious to dyspeptic stomachs. Chocolate is prepared from the seeds of the *theobroma cacao*, a native plant of the West Indies and Central America. The kernels of the roasted seeds are ground in a mill, whose sole rests on a heated iron plate, by which they are made into a brown pasty mass,

then sweetened with sugar or honey, mixed more or less with sago flour, or starch, and generally flavored with vanilla or cinnamon.

Chickory, or *suckory*, is a preparation of the roasted roots of a plant called *wild succory*, or *wild endive*, which is cultivated in Holland, Belgium, and Germany. It is used to adulterate coffee, and a spurious article is sold for chickory, made of roasted peas and beans, damaged corn, and coffee husks, and colored with Venetian red or Armenian bole.

Cocoa is another preparation of the seeds of the *theobroma cacao*, it is somewhat less greasy than chocolate, but has no other advantage.

There are a great variety of *acidulous* drinks in popular use. Most of them are prepared juices of fruits and sugar, as *lemonade*, *apple-tea*. *Bottle soda-water*, as generally prepared, is merely a mixture of carbonic acid gas in sweetened water. These beverages, in a hygienic point of view, possess but little importance. The only reason that the appetite demands them is, because the sense of taste is so torpified by stimulating food and seasonings, that it cannot relish simple water; still, they cannot be considered quite as healthful as pure water. *Effervescing* preparations of soda and tartaric acid, and of seidlitz powders, are decidedly injurious as common beverages, because they introduce into the system a large quantity of debilitating neutral salts. *Ginger* and *root beers* have had an extensive employment among popular beverages. The latter is rendered pungent by yeast fermentation, which develops from two to four per cent. of alcohol; this, of course, is against its healthfulness; but as such preparations will not keep but a very few days without becoming sour, the manufacturer often finds it profitable to add an additional quantity of alcohol. These drinks are trash at best, and worse than useless in their tendency to keep up artificial appetences, requiring strong, pungent, or gross beverages to satisfy.

In relation to the milder kinds of malt liquors, *small beer*, or *table beer*, as it is called, *porter*, *pale ale*, and *brown stout*, Pereira talks precisely like an "old-fashioned English gentleman." I quote Pereira mostly, because he is the latest and most approved author on dietetics as well as *materia medica* in the allopathic school. He says: "The practice of taking a moderate quantity of mild malt liquor, of sound quality, at *dinner*, is in general not only unobjectionable, but *beneficial*. Considered dietetically, beer possesses a three-fold property: it quenches thirst; it stimulates, cheers, and, if taken in sufficient quantity, intoxicates; and, lastly, it nourishes or strengthens." Surely his admiration of the virtues of grog was not excelled by that of the toper, who found it amply sufficient for food, drink, and *lodging*. Who can

wonder that drunkenness is the distinctive vice of Christendom, when the professors of the healing art teach such ridiculously false doctrines? But let us quote also Pereira's reasoning: "Its power of appeasing thirst depends on the aqueous ingredient (water) which it contains, assisted somewhat by its acidulous constituent. Its stimulating, cheering, or intoxicating power is derived either wholly or principally from the alcohol which it contains. Lastly, its nutritive or strengthening quality is derived from the sugar, dextrine, and other substances contained in the extract. Moreover, the bitter principle of hops confers on beer tonic properties." If the reader can discover in such reasoning any thing but the veriest nonsense, I confess he has the advantage of me.

Different Kinds of Natural Waters.—The natural waters of the globe have been classed into *common waters*, comprising rain, spring, river, well or pump, lake, and marsh waters; *sea waters*, including the ocean and the salt lakes or inland seas; and *mineral waters*, to which class belong all the springs, streams, or pools usually regarded as medicinal.

Rain water is the purest of all natural waters. When collected in cities, it is more or less impure at the commencement of the shower, from admixture with foreign matters suspended in the atmosphere, and is often loaded with the particles washed from the roofs of the buildings. After several hours of continuous rain in cities, and a much shorter time in country places, it comes down almost perfectly pure. Air is a constant constituent of or admixture with rain water, and it contains a slight trace of carbonate of ammonia, which is probably a product of animal decomposition, and the cause of rain water so readily running into the putrefactive process. *Snow water* does not differ materially from rain water, except in not containing air. That it is injurious to health has long been a vulgar error; eating snow, however, does not quench thirst; but melted snow is as efficacious for this purpose as rain water.

Spring water only differs from rain water in having percolated through the earth, and having, during its passage, either imparted some of the particles it held in solution to the soil, or taken up soluble matters from the soil, or both. Its properties will therefore depend entirely upon the nature of the soil. A majority of the springs in the United States are *hard*, owing to earthy and saline matters, the most common of which are sulphate and carbonate of lime. There are, however, many *soft water* springs; enough, in fact, to answer all the drinking purposes of as dense a population as the country can sustain

if it were conveyed to and distributed among the dwellings. The people in the country are generally singularly inattentive to the important matter of providing themselves with *pure soft* water. They are very apt to get their supply from the most convenient spring, instead of the best. If they fully appreciated the importance of good water, they would not locate the dwelling-house until they had located the spring or well.

River water is an admixture of rain and spring water; it always holds in suspension a greater or less amount of extraneous matter, and in and around cities is strongly contaminated with decomposing animal and vegetable matters. Much of the river water in this country, as it runs through the sparely-populated districts, is comparatively quite pure and healthful.

The water of the Thames, and in the vicinity of London, contains, as impurities, about 20 grains of solid matter to the gallon. Of this, carbonate of lime constitutes about 16 grains, and sulphate of lime and common salt about 3½ grains.

The Croton water of New York contains but a trifle over four grains of solid matter to the gallon, only a grain and a half of this being carbonate of lime; sulphate of lime, the chlorides of calcium and magnesium, and the carbonate of magnesia constitute a little over two grains. The Cochituate water of Boston is equally as pure, and the Schuylkill of Philadelphia nearly as pure.

Previous to the introduction of the Croton river, the Manhattan water supplied to our citizens contained, in Chambers and Reade streets 125 grains of impurities to each gallon; in Bleecker-street 20 grains; and in Thirteenth-street 14 grains. Some of the wells in the lower part of the city contained 58 grains. The water in the wells of Boston and Philadelphia were in no better condition.

The usual results of drinking very hard waters, and those strongly impregnated with the exuviæ of animal and vegetable substances, are severe dysenteries or protracted diarrheas, and chronic affections of the kidneys.

Well water is generally more impregnated with earthy salts, especially bicarbonate and sulphate of lime, than river water, or even spring water. Its hardness is shown by its curdling and decomposing soap, instead of mixing with it readily and forming a *suds*, as will soft water. Sulphate of lime (gypsum, plaster of Paris) is a frequent cause of diarrhea.

Horses manifest such an instinctive repugnance to hard water, that they will drink out of a turbid and muddy pool, provided its water is

soft, in preference to partaking of the clearest and most transparent water, if it be *hard*.

Lake water is generally very impure, being a collection of rain, river, and spring water, contaminated with putrefying animal and vegetable matters.

Marsh water is similar to lake water, but still more loaded with offensive and putrescent organic matters. The stench arising from marshy and swampy grounds, which are occasionally inundated from the sea, is owing to the decomposition of the sulphates of the sea water by the putrefying vegetable matters, which process evolves the intolerable sulphureted hydrogen gas.

Sea water contains on the average 3½ per cent. of solid matter. The amount varies considerably in different seas, and in different parts of the same sea. Its composition also varies in different localities. An analysis of 1000 grains of the water of the Mediterranean gave the following result: Water 959.26, chloride of sodium (common salt) 27.22, chloride of potassium 0.01, chloride of magnesium 6.14, sulphate of magnesia 7.02, sulphate of lime 0.15, carbonate of lime 0.20. Iodine, and bromide of magnesium have been found in some sea waters.

Taken into the stomach, sea water excites thirst, nausea, and, in large doses, vomiting and purging.

Mineral waters are classed according to the character of their prevailing impurities. Those whose predominating active principle is iron are called *chalybeate* or *ferruginous*. *Sulphurous* or *hepatic* waters are strongly impregnated with sulphureted hydrogen, which gives them an odor like rotten eggs. *Carbonated* or *acidulous* waters contain carbonic acid, which renders them sparkling and pungent. Of the *saline* mineral waters there are many sub-varieties, as the *calcareous*, *alkaline*, *silicious*, etc.

The *medicinal* fame of the "Congress water" at Saratoga is derived from the great amount of its *deleterious* ingredients. One gallon contains the following impurities: Chloride of sodium (common salt) 385.0 grains, hydriodate of soda 3.5 do., bi-carbonate of soda 8.982 do., bi-carbonate of magnesia 95.778 do., carbonate of iron 5.075 do., silex 1.5 do., hydro-bromate of potash, a trace; in all, 597.943 grains. Each gallon also contains 311 cubic inches of carbonic acid gas, and 7 of atmospheric air.

Dr. Steel, of Saratoga, very judiciously advises those who wish to experience the full benefit of this water to drink it only *once a day*—about three pints early in the morning; and he remarks very sensibly: "It would be much better for those whose complaints render them fit subjects for its administration, if the fountain should be locked up and

no one suffered to approach it after the hours of nine and ten in the morning." If it should be locked up at all hours of the day and night, and a stream of pure soft water substituted, the advantage to the invalid portion of the guests would be still greater.

The *Iodine Spring*, at that place, differs from the former mainly in containing 3½ grains of iodine to the gallon, with a little more than half the quantity of the other ingredients. The *Sans Souci Spring*, at Ballston Spa, differs from the Congress principally in containing carbonate of lime, instead of bi-carbonate of magnesia, and possessing altogether a little less than half the amount of impurities.

Tests of Ordinary Impurities.—The following are the tests (copied from Pereira's "Food and Diet"), by which the presence of the usual impurities of common waters may be ascertained:

1. *Ebullition.*—By boiling, air and carbonic acid gas are expelled, while *carbonate of lime*, held in solution by the carbonic acid, is deposited; this deposit is the fur or crust which lines tea-kettles and boilers.

2. *Protosulphate of Iron.*—If a crystal of this salt be introduced into a phial filled with the water to be examined, and the phial be well corked, a yellowish-brown precipitate (sesquioxide of iron) will be deposited in a few days, if *oxygen gas* be contained in the water.

3. *Litmus.*—Infusion of litmus, or syrup of violet, is reddened by a *free acid.*

4. *Lime-water.*—This is a test for *carbonic acid*, with which it causes a white precipitate (carbonate of lime), if employed before the water is boiled.

5. *Chloride of Barium.*—A solution of this salt usually yields, with hard water, a white precipitate, insoluble in nitric acid; this indicates the presence of *sulphuric acid*, which, in common water, is combined with lime.

6. *Oxalate of Ammonia.*—If this salt yield a white precipitate, it indicates the presence of *lime*, carbonate and sulphate.

7. *Nitrate of Silver.*—If this occasion a precipitate insoluble in nitric acid, the presence of *chlorine* is inferred.

8. *Phosphate of Soda.*—If the lime contained in common water be removed by ebullition and oxalic acid, and to the strained and transparent water ammonia and phosphate of soda be added, any *magnesia* present will, in the course of a few hours, be precipitated in the form of the white ammoniacal phosphate of magnesia.

9. *Tincture of Galls.*—This is used as a test for *iron*, with solutions of which it forms an inky liquor (tannate and gallate of iron). If the

best produce this effect on the water before, but not after boiling, the iron is in the state of *carbonate;* if after as well as before, in that of *sulphate*. *Tea* may be substituted for galls, to which its effects and indications are similar. *Ferrocyanide of potassium* yields, with solutions of the *sesquisalts of iron*, a blue precipitate, and, with the *protosalts*, a white precipitate, which becomes blue by exposure to the air.

10. *Hydrosulphuric Acid* (sulphureted hydrogen).—This yields a dark (brown or black) precipitate (a metallic sulphuret), with water containing *iron* or *lead* in solution.

11. *Evaporation and Ignition.*—If the water be evaporated to dryness, and ignited in a glass tube, the presence of *organic matter* may be inferred by the odor and smoke evolved, as well as by the charring. Another mode of detecting organic matter is by adding *nitrate* or *acetate of lead* to the suspected water, and collecting and igniting the precipitate, when globules of melted lead are obtained, if organic matter be present. The *putrefaction* of water is another proof of the presence of organic matter. *Nitrate of silver* is also a test, as before mentioned.

Purification of Common Waters.—*Filtration* removes all insects, living beings, and all suspended impurities, but it does not deprive water of the substances it holds in solution. *Boiling* destroys the vitality of any animals or vegetables it may contain, expels air or carbonic acid, and causes the precipitation of carbonate of lime. Sometimes it may be advantageous to *boil* water first, and *filter* it afterward. *Distillation* purifies water from every thing except traces of organic matter; it is, however, a process too troublesome and expensive for general employment. *Chemical agents* are sometimes made use of to free water from particular ingredients. *Alum*, two or three grains to a quart, will cleanse muddy water; the alum decomposes the carbonate of lime; sulphate of lime is found in solution, and the alumina is precipitated in flocks, carrying with it mechanical impurities. Though this process renders the water clear, it adds nothing to its healthfulness, but renders it even harder, by converting the carbonate into sulphate of lime. *Alkaline carbonates* soften water by decomposing all the earthy salts, and precipitating the earthy matters; the carbonates of soda and potash are much used in washing on this account; they do not render the water any purer, nor fit for drinking or culinary purposes

Adulterations of Common Water.—The purest water is liable to become impregnated with poisonous properties when conveyed

through some kinds of metallic pipes, particularly leaden ones. The air contained in very pure water rapidly corrodes lead; distilled water, from which the air is excluded, has no action on it until air is again admitted, when a thin white crust of carbonate and hydrate of the oxide of lead is speedily formed. Rain water is often impregnated from the lead of roofs, gutters, cisterns, and pipes. Combinations of lead, iron, and zinc, and other mixed metals, as in cases where iron bars are used to support leaden cisterns, the introduction of iron pumps into leaden cisterns, etc., often produce a galvanic action which dissolves a portion of the lead. The leaden covers of leaden cisterns are also a source of contamination; the water evaporates from the cistern in the form of pure or distilled water, and condenses upon the lid, which it corrodes, and then falls back into the cistern impregnated with the metal. Such cisterns should have wooden covers.

Various saline matters impair the corrosive action of water and air, and exercise a protecting influence. The carbonates and sulphates afford the best security against lead poisoning, because they form a protecting crust upon the surface of the metal. Dr. Lee declares that "Palsy is often met with in the city of New York among grocers and porter-house keepers, and is doubtless occasioned by their drinking beer in the morning which has stood in the lead pipes over night."

Chemists do not agree respecting the action of our Croton water on its leaden conduits; but experience settles the question affirmatively. It becomes our citizens, therefore, to exercise a constant watchfulness in its employment, which is, to let as much water run as the leaden pipes contain to their junction with the iron pipes in the streets, before drinking it. With this precaution, and the frequent emptying of the leaden pipes through the day, it is not probable that any appreciable injury will be experienced from the lead. But these facts prove that the principle of conveying water through our dwellings by leaden pipes is wrong, and a substitute should engage the attention of ingenious men and philanthropists.

CHAPTER IV.

OF FOOD.

Chemical Elements of Food.—In the present state of chemical science all known bodies, mineral and organized, are regarded as constituted of fifty-five simple substances, which are called chemical ele-

ments. Of these fifty-five elements nineteen have been found in organized bodies, animal and vegetable. Of these nineteen elements thirteen are regarded as essential constituents of the human body, viz., *carbon*, *hydrogen*, *oxygen*, *nitrogen*, *phosphorous*, *sulphur*, *iron*, *chlorine*, *sodium*, *calcium*, *potassium*, *magnesium*, and *fluorine*.

Pereira lays down the following postulate: "A living body has no power of forming elements, or of converting one elementary substance into another; and it therefore follows that the elements of which an animal is composed must be the elements of its food."

If this position is correct, any alimentary substance capable of sustaining the structures of the human body, must possess all of the chemical elements above-named among its constituents. We do not, however, find such to be the fact. Milk affords complete nutrition to the young mammal, and occasionally to the adult; wheat and apples are capable of perfectly nourishing the body; yet neither of these articles, nor all together, yield to chemical analysis all of the elements above-named.

It is, moreover, probable, and I think demonstrable, that, to a certain extent, the vital functions of a living organism have the power of transmuting substances supposed to be elementary. This is proved by the fact, that the lime found in the bones of the chick when it quits its shell did not pre-exist in the recent egg. It could not be derived from the shell, because the membrane which lines its interior is not vascular; hence its only source is the transmutation of some other substance. The accuracy of Pereira's proposition may be admitted, or, rather, it cannot be controverted, with a qualification he has afterward expressed, viz., that many substances now regarded as elementary may be in reality compounds, which the body, though not able to create, may compose and decompose.

Liebig, and most of the recent writers on physiology and organic chemistry, have distinguished foods into *nitrogenized* and *non-nitrogenized*—a distinction based on the presence or absence of nitrogen when the articles are subjected to chemical analyses. It is *assumed* that the former only are capable of transformation into blood, and of forming the substance of the tissues; hence Liebig has called them the *plastic elements of nutrition*. The non-nitrogenized foods he denominates *elements of respiration;* their use in the animal economy being, according to his notion, to keep up the animal heat, by yielding carbon and hydrogen to be oxidated in the lungs. The following tabular arrangement, copied from Pereira, shows the absurdities into which men of the most extensive learning become involved, in the attempts to square all the phenomena of life by the comparatively insignificant

chemical processes and experiments they can perform in a chemical laboratory:

NITROGENIZED FOODS, *or Plastic Elements of Nutrition.*		NON-NITROGENIZED FOODS, *or Elements of Respiration.*	
Vegetable	Fibrine.	Fat.	Pectine.
"	Albumen.	Starch.	Bassorine.
"	Caseine.	Gum.	Wine!
Animal	Flesh.	Cane Sugar.	Beer!!
"	Blood.	Grape Sugar.	Spirits!!!
		Sugar of Milk.	

Whenever any man of science names any form of intoxicating *drink* among the *foods* of the human body, I want no further evidence that he is calculating the problems of life on principles fundamentally erroneous. Again, if nitrogenized foods are capable of nourishing the tissues *because* of their nitrogen, it would follow that those aliments which contain the largest proportion of nitrogen would be most nutritious. But this does not hold true in practice, for flesh-meat contains fifteen per cent. of nitrogen, while wheat, rye, oats, barley, corn, rice, peas, beans, and lentils contain only from two to five per cent.; yet each of these articles is more nutritious than flesh. Rice, which contains less than two, and wheat, which contains but a fraction over two per cent. of nitrogen, are three times as nutritive as flesh-meat, notwithstanding this contains nearly seven times as much nitrogen.

The truth seems to be that an alimentary substance is more or less nutritious, not according to the presence or absence of nitrogen, or any other single constituent, but according to the constitutional relation of the whole substance, as compounded by the arrangement of all its constituent elements. The most wholesome aliment and the most deadly poison may be composed of the same chemical elements, the only difference being in the proportions in which their constituents are combined.

It is true, furthermore, that nearly and probably all of the alimentary substances which are capable of sustaining the prolonged nutrition of animals, contain greater or less proportions of nitrogen, oxygen, carbon, and hydrogen, with more or less of a number of other substances, which are called elements. And it is quite clear to my mind that no substance entirely destitute of either nitrogen, oxygen, carbon, or hydrogen, possesses much alimentary value, either as a "plastic element of nutrition," or as an "element of respiration." If fats, oils, alcohol, etc., are taken into the stomach, they must be disposed of

in some way; and as they are not convertible into the tissues, they are oxidated in the circulation, and expelled by the lungs, liver, skin, kidneys, and bowels. That part of this excretory process which is performed by the lungs has been mistaken for a special vital process, by which the body is warmed; and the commotion of the organism in getting rid of these offensive materials has been mistaken for a functional process, which makes use of wine, beer, and spirits in the nutritive economy of the system. Such errors, emanating from such high authorities in the scientific world, have a disastrous effect on the public mind, and tend powerfully to check the progress of all the reforms of the age.

The per centage of carbon contained in the aliments in common use, rejecting fractions, is as follows: Wheat, dried *in vacuo* at 230° Fahr. 46, oats, do. 50, rye, do. 46, potatoes 12, do. dried 44, turnips 3, do. dried 42, artichoke, dried 43, peas 35, do. dried 46, lentils 37, beans 38, fresh bread 30, black bread, dried 45, ox blood 10, do. dried 51, fresh lean meat 13, dry lean beef 51, roasted veal 52, sugar-candy 42, butter 65, mutton fat 78, hog's lard 79, olive oil 77. Alcohol, an aliment according to Liebig and Pereira, contains 52.

Oxygen and hydrogen exist in acetic acid, starch, gum, and sugar, in the proportions which form water; in oil, alcohol, malic acid, gelatin, gluten, animal and vegetable fibrin, albumen, and casein, the hydrogen is in excess; in pectin, citric acid, and tartaric acid the oxygen is in excess.

Phosphorus is found in the muscular and nervous tissues of the body, in the bones, in the spermatic fluid, and in the ovary. In some diseases the breath of patients emits a strong phosphoric odor. Phosphorus is also a constituent of nearly all vegetable substances, existing in combination with lime or magnesia.

Sulphur is also found in the fibrinous and albuminous tissues, and in hair, bone, casein, and the saliva. Metallic matter held in the mouth is often discolored by the action of sulphur; and gold plates used to support artificial teeth, and the amalgam of silver, sometimes employed to fill decayed teeth, often become incrusted with metallic sulphuret. Sulphur is a constituent in nearly all the vegetable substances employed as food. Culinary vegetables generally contain it; the *cruciferæ* in abundance. Asafœtida, which contains a large proportion, is sometimes used as a seasoning or condiment; and although it would not be inviting to a majority of American olfactories or palates, some Oriental nations consider it as "food for the gods." Sulphur is readily detected in mustard, white cabbage, potatoes almonds, peas, and other vegetables.

Iron is found in the *ashes* of animals and vegetables. The quantity, however, detected in organized beings is exceedingly small, and the precise state in which it exists in living beings is entirely unknown. Chemists find a very small quantity in the blood corpuscles and hair, but are unable to assign it any office. Liebig's theory, that the color of the blood depends on iron, has been positively disproved. A slight trace of iron is found in most vegetable articles used as food; for examples, milk, mustard, cabbage, potatoes, peas, and cucumbers. It is by no means yet proved that iron is an essential constituent of any living being. Its liability to oxidation, its general employment in agriculture and the arts, and its abundance in the mineral kingdom, afford at least good grounds for conjecture that the variable quantities found in plants and animals are accidental ingredients.

Pereira remarks: "But the well-known influence of chalybeates in the disease called *anæmia*, in which the blood is found to contain a smaller quantity of iron than in a state of health, favors the notion that the proper color of the blood is in some way connected with the amount of iron contained in it; for one of the most characteristic symptoms of this malady is an absence of the natural vermilion tint of the complexion."

Unless the preparations of iron in the hands of European practitioners operate very differently from those prescribed by American physicians, Pereira must labor under a great mistake. The medical journals of this country have, during a year or two past, reported many cases of anæmia treated with chalybeates, nearly every one of which terminated fatally. The particulars of several cases may be found in the Water-Cure Journal for 1850.

Chlorine is found in the blood, in combination with sodium, forming common salt; in the gastric juice, combined with hydrogen, constituting hydrochloric acid. It is also found in saliva, and in all the excretions. It is a constituent of nearly all vegetable aliments, from whence a sufficient supply is derived for the wants of the animal organism. The dietetic use of salt, therefore, to furnish chlorine to the system is unnecessary.

Sodium exists in most of the animal tissues and secretions. A large part of that found in the different solids and fluids is doubtless derived from the use of table salt, for it is not an ordinary constituent of vegetables unless they grow in the neighborhood of salt water.

Calcium, in the form of a subphosphate of lime, is found in all the animal solids, in the blood, and in most of the secretions. It is a constituent of most vegetables; it is found in the cereal grains, onions, garlics, rhubarb, grapes, gum, and unrefined sugar.

Magnesium, in small quantities, is found in the blood, teeth, bones, nerves, glands, and other parts of the body. It is also a constituent of grains, potatoes, and other vegetables.

Potassium is found in minute traces in the blood, solids, and several of the secretions. It is a constituent of most kinds of vegetables, especially inland plants; it is readily detected in grapes and potatoes.

Fluorine has been detected by Berzelius in minute quantities in the bones and teeth of animals, in the form of fluoride of calcium. It is never found in plants, and it is probably, when found in animals, an accidental ingredient rather than a normal constituent.

Proximate Elements of Food.—Water, gum, sugar, starch, lignin, jelly, fat, fibrin, albumen, casein, gluten, gelatin, acids, salts, and *alcohol*, are called *alimentary principles* by Pereira and other authors. They are all compounded of two or more chemical elements, and all of them, except alcohol, are produced in the process of organic growth and development in the vegetable kingdom. Alcohol, as already stated, results from the death and putrefaction of organic matter. Foods proper are compounds of these proximate elements in various proportions, as these are compounds of the ultimate elements. Physiologists, in directing so much of their attention to the investigation of the chemical qualities of alimentary principles, and so little to the physiological effects of aliments themselves, have taught more errors than truths in relation to food and diet.

None of the proximate elements of food are capable of the prolonged nutrition of animals, though gluten, which is in reality a very compounded substance, may alone sustain life for a considerable time. Nor is the power of an alimentary principle, or an aliment proper, to sustain the animal organism, at all proportioned to what is chemically regarded as its nutritive property. Dogs fed on sugar, or butter, or fine flour, become plump and adipose, but die of starvation in a few weeks. Horses and cattle confined to the most nutritious grains soon grow sickly and die; and the human being, restricted to a diet of starch, fibrin, or superfine flour, soon becomes unhealthy. But a suitable admixture of bones, grass, straw, woody fibre, bran, etc., usually considered as innutritious, allows the animal organism to select and assimilate such nutritive materials as are needed to maintain the integrity of its structures and functions, and reject the rest.

Water, constituting about three fourths of the entire weight of the body, and being essential to the performance of all the vital processes, may be regarded as *liquid aliment*, all the other aliments or foods being

solid, or solids dissolved in water. Its properties have been considered in the preceding chapter.

Gum is the *mucilaginous* alimentary principle of authors. It exists almost universally in plants. The gums called *Arabic*, *Senegal*, *East Indian*, *Barbary*, *Cape*, *tragacanth*, *cherry*, *plum*, and *bassora*, exude spontaneously, and concrete on the stems of trees or plants. The following articles contain, in one hundred parts of gum or mucilage, rejecting unimportant fractions: Barley-meal 4, oatmeal 2, wheat-flour 2 to 5, wheat-bread 18, rye-meal 11, corn 2, rice 0·1 to 0·71, peas 6, garden bean 4, kidney bean 19, potatoes 3 to 4, cabbage 3, sweet almonds 3, ripe green gage 5, ripe fresh pears 3, gooseberries 0·78, cherries 3, ripe apricot 5, ripe peach 5, linseed 5, marshmallow root 35.

Sugar is very generally distributed throughout the vegetable kingdom. Barley-meal contains about 5 per cent., oatmeal (including bitter matter) 8, wheat-flour 4 to 8, wheat-bread 3 to 4, rye-meal 3, corn 1·45, rice 0·05 to 0·30, peas 2, sweet almonds 6, figs 62, ripe green gage 11, tamarinds 12, ripe fresh pears 6, ripe pears kept some time 11, ripe gooseberries 6, ripe cherries 18, ripe apricot 11, ripe peach 16, melon 1·5, expressed carrot juice evaporated to dryness 94, beet-root 5 to 9, cow's milk 4·77, ass's milk 6·08, woman's milk 6·50, goat's milk 5·28, ewe's milk 5.

Sugar, though taken freely into the stomach, and sometimes reproduced in the secretions, as in the urine of diabetic patients, is never found in healthy blood. It must therefore undergo decomposition before it is admitted into the circulation.

Most of the *raw* sugars of commerce contain various impurities, and the *purified* or *refined* sugars have a constipating effect on the bowels. The best article for dietetical purposes is that of a pale yellow color, with large, clear, brilliant crystals. *Syrup* is made by dissolving two pounds and a half of sugar in a pint of water. *Molasses* is the viscid fluid which drains from raw sugar. *Treacle* is a dark-brown uncrystallizable syrup, which drains from the molds in which refined sugar concretes.

Sugar is the basis of an immense quantity and variety of hard confectionary—*lozenges*, *brilliants*, *pipe*, *rock*, *comfits*, *nonpareils*. They are mixed more or less with flour, starch, gum, and often other less wholesome articles, flavored with a variety of pungents and perfumes, and not unfrequently medicated with calomel, tartarized antimony, morphine, and many other poisons. The whole of it is abominable trash at best; and although the children of our cities have their hands full of it a good proportion of the time, every mother ought, and all *intelligent* mothers will, expel it from their houses.

Starch is found in the seeds, fruits, roots, stems, tubercles, and mosses of a large portion of the vegetable kingdom. It constitutes the *amylaceous alimentary principle* of authors, and is known under the various names of *amylum*, *starch*, *fecula*, and *farinaceous matter*. Wheat-flour yields in one hundred parts 56 to 72 parts, wheat-bread 53, barley-meal 67, oatmeal 59, rye-meal 61, maize or corn 81, rice 82 to 85, peas 32, garden bean 34, kidney bean 36, arrow-root plant 12 to 26, yam 12 to 22, bread-fruit 3, tapioca plant 13, Iceland moss 45, batatas 9 to 13, kidney potato 9, red potato 15.

The much larger quantity of starch contained in corn than in the potato, has suggested the preparation of it from the former article. Recently several manufactories of corn starch have been established in this country, and starch made from this grain is now in common use as a dietetic article as well as for the toilet. Its value as a food is far inferior to that of the whole grain. In fact, it is employed more as desert or *superfluity* than as a nutriment.

Dr. Prout thinks starch "differs from sugar in being a *necessary* article of food, without which animals could not exist, while sugar is not." But as starch is not found in animal food, and as there are many animals of the carnivorous kind which eat no other, this position can only be correct in its application to herbivorous animals.

The different kinds of amylaceous matters in common use are *sago*, *tapioca*, *arrow-root*, *rice starch*, *potato starch*, *corn starch*, and *lichenin*, or *feculoid*, obtained from Iceland moss. Sago is the medulla or pith of the stems of various species of palms; it is manufactured principally in the Moluccas, and comes to us in the form of *sago-meal*, *pearl sago*, and *common sago*. The first is principally used in making sago-sugar; the second is generally employed for domestic purposes. Tapioca is obtained from the roots of a plant, said to be poisonous, in the Brazils. Its irregular, lumpy form is owing to its having been dried on hot plates. *Cassava bread*, used in Brazil, Guiana, Jamaica, and other places, is made of the whole roots of the plant, which are grated and then pressed in a hair bag. Arrow-root is obtained from the roots of the plant, whose botanical name is *maranta arundinacea*. There are several varieties in market, as West Indian, Tahiti, East Indian, Portland, etc.

In a dietetical or medicinal sense there is very little to choose in these different forms of starch. They are highly commended by physicians to children and invalids, but as food they are incomparably inferior to the whole grains, vegetables, and fruits from which they are derived.

Lignin is the woody fibre which constitutes the basis of all vege

table structures. It also forms the skin of potatoes, the husk of grapes, gooseberries, etc., the peel and core of apples and pears, the skin and stone of plums, peaches, etc., the seed-coats of the kernels of nuts, the membranous covering of beans and peas, the pod of melons, cucumbers, etc., and the bran of grains. The per centage contained in various aliments is: Rice 4·8, barley 18·75 (husk), oats 34 (bran), rye 24 (husk), ripe apricots 1·86, ripe green gages 1·11, ripe peaches 1·21, ripe gooseberries 8·01, ripe cherries 1·12, ripe pears 2·19, sweet almonds 9 (and seed-coats), peas 21·08 (amylaceous fibre), garden bean 25·94 (amylaceous fibre and membrane), kidney bean 18·57 (do.), potatoes 4·03 to 10·05 (amylaceous fibre), cocoanut kernel 14·95.

Lignin, or wood, when divested of all its soluble matters, repeatedly subjected to the heat of an oven, and finally ground to a fine powder, yields a flour, on being boiled with water, resembling corn-flour, and capable of being made into a jelly or loaf-bread, which is both agreeable and nutritious. The nutritive importance of lignin in the animal economy is equal to that of starch, or of any other proximate element, for none of the others, nor all together, can perfectly sustain the integrity of the organism without some admixture of the woody element, which authors usually put down as innutritious and indigestible. Pereira thinks it serves as a *mechanical stimulus* to promote the action of the bowels—a queer phrase for him to apply to what he calls an alimentary principle. Dr. Prout remarks: "Of the numerous shapes assumed by lignin, the best adapted for excremental purposes is undoubtedly the external covering of the seeds of the *cerealia*, and particularly of wheat. Bread, therefore, made with undressed flour, or even with an extra quantity of bran, is the best form in which farinaceous and excremental matters can be usually taken; not only in diabetis, but in most of the other varieties of dyspepsia accompanied by obstinate constipation. This is a remedy, the efficacy of which has long been known and admitted: yet, strange to say, the generality of mankind choose to consult their taste rather than their reason, and by officiously separating what nature has beneficently combined, entail upon themselves much discomfort and misery."

Jelly is found in both animals and vegetables. *Vegetable jelly* constitutes the *pectinaceous alimentary principle*, so called because it has for its base starch and *pectin*, or *pectic acid*. Pectin and pectic acid are regarded by some chemists as identical. One or both are found in most pulpy fruits, currants, apples, pears, quinees, apricots, plums, and in melons, gooseberries, blackberries, raspberries, strawberries, bilberries, mulberries, cherries, tomatoes, oranges, lemons, and tamarinds. The artichoke, onion, carrot, turnip, celery, beet, and many other

roots, yield a portion of it. Sugar promotes the solidification and gelatination of pectin and pectic acid, and is, therefore, conveniently employed in the preparation of fruit jellies. *Jams* are mixtures of vegetable pulps with sugar. *Carrigeen*, *pearl*, or *Irish moss*, are vegeto-gelatinous substances resembling pectin.

Considered dietetically, fruit jellies are among the slight deviations from the healthful preparations of food. They are far less valuable than the crude fruits, or the fruits dried, stewed and sweetened, or preserved in their own inspissated juices.

The *organic acids* constitute the *acidulous alimentary principle* of authors. They are the *acetic*, *citric*, *tartaric*, *malic*, *oxalic*, and *lactic*. Those chemists who regard tea as nutritious add to this list *tannic acid*. It is not certain that *acetic acid* is entitled to a place among organic elements. It is found in pyroligneous acid, vinegar, sour beer, and sour wine; but these materials are not the products of formation, but of retrogradation. Vinegar, which is generally considered as almost identical with acetic acid, is very far from being alimentary. Like alcohol, it is a product of fermentation; and although it is regarded as "agreeable," "cooling," "refreshing," "antiseptic," etc., by the medical profession, it is certainly very debilitating to the human stomach. Its tendency to produce leanness has long been known. Young girls who have employed it freely to diminish an unfashionable plumpness of body, have soon found themselves fatally consumptive. If any argument can be drawn from antiquity in favor of the propriety of its dietetical employment, the same argument may be made to sanction every evil thing under the sun.

Citric acid is found in the lemon, orange, citron, lime, shaddock, cranberry, and, mixed with an equal quantity of malic acid, in the red currant, strawberry, raspberry, cherry, and bilberry. In the pulp of the tamarind it exists, mixed with malic and tartaric acids.

Tartaric acid is found in the free state in tamarinds, grapes, and pine-apples. In the form of cream of tartar it exists in tamarinds, grapes, and mulberries. This acid is much employed in effervescing compounds.

Malic acid is extensively distributed; it is found in apples, pears, quinces, plums, apricots, peaches, cherries, gooseberries, currants, raspberries, strawberries, blackberries, pine-apples, barberries, elderberries, grapes, tomatoes, tamarinds, and other fruits

Oxalic acid is found in garden rhubarb, common sorrel, wood sorrel, and some other vegetables. It may be produced by the action of nitric acid on sugar, starch gum, wool, hair silk, and many vegetable acids.

Lactic acid exists in sour milk; it is also generated in the *souring* process of various vegetables; for example, when oatmeal sours in a large quantity of water. Liebig states that no lactic acid is found in a healthy stomach, but that in some dyspeptic individuals sugar yields lactic acid, attended with flatulence and preternatural acidity of the stomach. These facts prove conclusively to my mind that this acid is, like vinegar, a product of destructive decomposition, instead of organic formation, and hence is in no sense an aliment.

The precise chemical offices which the vegetable acids perform in the animal economy is not obvious, nor is it of the least consequence for us to know. It is sufficient that they exist in those fruits and vegetables which nature has provided for our nourishment. And if nature has assigned them any nutritive duty, it is at least probable that she has provided them in about the proper quantities and proportions, just as she has the sugar, salt, starch, gum, and all the other nutritive elements, so that we may use them as we find them, without troubling ourselves to manufacture an extra supply by way of "*necessary*" seasonings.

Fixed oils constitute the *oleaginous aliments*, and the *oily alimentary principle* of authors. Under this head some authors include also the volatile oils of those vegetables which are used as condiments—mint, marjoram, savory, sage, thyme, carraway, anise, fennel, parsley, mustard, horseradish, garlic, onions, eschalots, leeks, cinnamon, nutmeg, mace, cloves, pepper, allspice, ginger, bitter almonds, peach leaves, cherry, laurel, etc. Some of these vegetables do indeed possess alimentary properties, but the volatile oil residing in them is as destitute of nutritive virtue as vinegar or alcohol.

The fixed oils are: *Fat*, *suet*, *tallow*, *lard*, or *axunge*, *marrow*, *grease*, *butter*, and *blubber*, derived from the animal kingdom, and *olive oil*, *almond oil*, *walnut* and other *nut oils*, derived from vegetables.

The quantity of oil or fat in 100 parts of the following substances is: Filberts 60, olives 32, olive seeds 54, walnuts 50, earth-nut 47, cocoa-nut (fleshy part) 47, almonds 46, plums 33, white mustard 36, black mustard 18, grape stones 11 to 18, maize 9, dates 0·2; yolk of eggs 28, ordinary flesh-meat 14, ox liver 4, cow's milk 3·13, human do. 3·55, ass's do. 0·11, goat's do. 3·32, ewe's do. 4·20, bones of sheep's feet 5·55, bones of ox head 11·54

Fats are peculiarly liable to become rancid on exposure to the air; a high degree of heat also produces chemical changes which render them exceedingly acrid and irritating to the digestive organs; hence *frying* is a very objectionable method of cooking.

Pereira says: "Fixed oils, or fat is more difficult of digestion, and

more obnoxious to the stomach than any other alimentary principle. Indeed, in some more or less obvious or concealed form, I believe it will be found the offending ingredient in nine tenths of the dishes which disturb weak stomachs. Many dyspeptics, who have most religiously avoided the use of oil or fat in its obvious or ordinary state (as *fat meat*, *marrow*, *butter*, and *oil*), unwittingly employ it in some other more concealed form, and, as I have frequently witnessed, have suffered therefrom." Liebig, as already stated, considers fatty matter the principal fuel by which the animal heat is sustained. Dr. Beaumont ascertained that the gastric juice had a very slow and feeble action on fatty matters, either in or out of the stomach. Dr. Combe states that there is one form of dyspepsia in which the fat of bacon is digested with perfect ease, when many other apparently more appropriate articles of food oppress the stomach for hours. Prof. Lee, of this city, remarks: "We have treated many cases of cholera infantum, where every thing would be rejected from the stomach except salt pork, or fat bacon, rare broiled, and given in small quantities." I think an explanation of the cases mentioned by Drs. Combe and Lee may be found in the fact that such stomachs, and usually the duodenum also, are loaded with foul, acid, acrid, or putrescent secretions, which the grease mingles with, and for a time obviates their irritation. If *warm water* had been freely given, and the cutaneous function attended to, the pork and bacon might have been spared with advantage. Brandy will often quiet a dyspeptic's stomach, and at the same time be one of the worst quieters he could employ, and calomel will often "stay on the stomach" when the patient would be better if it were off. Professor Dunglison, in his recent work on Human Health, says, "Oleaginous substances are eminently nutritious;" an assertion pre-eminently susceptible of disproof.

The most objectionable dishes, on account of their fatty character, at ordinary tables, are yolk of eggs, livers, brains, strong cheese, butter-cakes and toast, pastry, marrow-puddings, suet-puddings, hashes, stews, broths, and several kinds of fishes, as eels, sprats, salmon, and herrings.

The vegetable fixed oils are less indigestible, and from their less putrescent tendency, more healthful than the animal. Indeed, it is highly probable that persons long accustomed to a plain, unstimulating, and unconcentrated diet, could employ the oily fruits, seeds, and nuts as a part of their aliment with entire physiological satisfaction.

Vegetable fibrin, *albumen*, *casein*, and *gluten*, and *animal fibrin*, *albumen*, and *casein*, constitute the *proteinaceous alimentary principle of Pereira*, which, except in not including gelatin, agrees with the *albuminous alimentary principle* of Dr. Prout. *Protein*, however, from

which this group of proximate elements is named, has no real existence in organized beings at all; but chemical analysis resolves the fibrin, albumen, and casein of both animal and vegetable substances into *a something and* salt sulphur, phosphorus, potash, soda, and phosphate of lime, and this *something*, which is formed in the process of analysis, is called protein. Protein, from whatever substance obtained, exhibits the same identical composition, that is, as nearly as can be determined by chemical analysis, which is always imperfect, and never quite uniform in determining the atomic constitution of complicated organic substances.*

The fibrin, albumen, and casein of animals are chemically identical with the fibrin, albumen, and casein of vegetables. According to Liebig, they are *produced* by vegetables only, although the animal organism is capable of converting one of them—one modification of protein, into another. If this be true, and if the proteinaceous compounds—the "plastic elements of nutrition"—only are capable of forming the tissues, all the truly nutritive materials of animals not only exist in, but are *formed* in vegetables; and this fact forms a strong presumption in favor of the superiority of a purely vegetable diet—taking the aliment directly from the vegetable kingdom in its primitive purity and vitality, before it is vitiated by the taint of animal deterioration and putrefaction.

Vegetable fibrin exists abundantly in wheat, rye, barley, oats, maize, rice, and the juice of grapes. It is also found in buckwheat, and in many newly expressed vegetable juices, as of carrots, turnips, and beet-root; it exists also in the raw gluten obtained from wheaten flour Animal fibrin is the principal constituent of lean flesh, and is found in the blood. One hundred parts of lean beef contain of fibrin about 18, veal 17, mutton 20, pork 17, chicken 17, cod, haddock, sole, each about 13, pancreas of calf 8, blood of sheep 0·03, blood of ox 0·37, blood of hog 0·46.

Vegetable albumen is found in abundance in oily seeds—almonds, nuts, etc.; it is a constituent of wheat and other grains, and a considerable quantity is contained in the juices of carrots, turnips, asparagus, cauliflowers, cabbages, etc. It differs from albumen in not coagulating when heated, and from fibrin, in dissolving in water. Animal albumen exists in the solid state in flesh, glands, and viscera, and in the fluid state in the egg, and in the serum of the blood. The quantity contained in 100 parts of the following aliments is: Blood of the ox, hog, goat, and sheep 18 to 19, beef 2·2, veal 2·6 to 3·2, pork 2·6, deer 2·3, pigeon 4·5, chicken 3 carp 5·2, trout 4·4, sweet-bread of calf 14, caviare (fresh) 31, liver of ox 20, yolk of egg 17, white do 15, East India isinglass 7 to 13

Vegetable casein has been called *legumin*, because it is found chiefly in leguminous seeds—peas, beans, lentils. Almonds, nuts, and other oily seeds contain it with albumen. Many vegetable juices yield it in small quantities. It is soluble in water, unlike fibrin, and uncoagulable when its aqueous solution is heated, unlike albumen. Animal casein is the coagulable matter in milk, and forms its *caseum*, or curd. In the liquid state it does not coagulate by heat. *Cheese* is the coagulated casein deprived of its whey, and mixed with more or less of butter. When *rich* in butter, cheese is very liable to undergo spontaneous decomposition, and generate active poisons. The strong, piquant flavor of old cheese depends on oleic acid, and an acrid oil, both extremely unwholesome. The per centage of casein in milk is: Woman's 1·52, goat's 4·02, ewe's 4·50, ass's 1·82, cow's 3 to 4·48. In two samples of cow's milk, the animals fed on potatoes and hay, one yielded 15·1, the other only 3·3.

As a food, liquid casein, curd, and fresh cheese are wholesome articles, but all old cheese is an exceedingly obnoxious aliment. Dr Dunglison says: "Cheese is supposed to be an excellent condiment, and accordingly it is often systematically taken at the end of dinner, as a *digestive*." Dr. Dunglison *ought* to have added, especially as he was writing the "Elements of Hygiene," that the supposition was a very erroneous one, and the practice a very bad one.

Gluten is the tenacious elastic mass which is left of wheaten dough after washing away the gum, sugar, starch, and albumen. It is a mixture of several organic principles, and is regarded as one of the proteinaceous compounds. Liebig's *vegetable fibrin* is the insoluble portion of gluten when it is boiled in alcohol. *Mucin* is the substance which deposits as the hot alcoholic solution of the soluble portion of gluten cools, and the portion remaining in solution is called *gluten*. The *pure gluten* of authors is the compound of *gluten* and *mucin*. It is the gluten of wheaten flour which renders it adhesive, and conveniently manufactured into *macaroni*, *vermicelli*, and similar pastes; to its larger proportion of this ingredient, wheat owes its superiority to other grains for the purposes of making *fermented* bread, crackers, and cakes. In the ordinary commercial process of bread-making (bakers' bread) the gluten is more or less destroyed, and converted into acetic acid, which is neutralized by ammonia, or some other alkali. If the panary fermentation is allowed to proceed beyond the point of converting the sugar of the flour or meal into carbonic acid gas (which being diffused among the ductile and tenacious particles of gluten, puffs up, or *raises* the dough), the process of decomposition attacks the gluten itself, which it literally *rots*, and although such bread may be

exceedingly light and spongy, and expand into the "largest loaf," it is very unwholesome, compared with *good bread*, and after standing twenty-four hours becomes insipid and disagreeable.

The quantity of glutinous matter contained in the *cereal* grains is liable to great variation, according to soil, manner of cultivation, species of grain, etc., if we may trust the deductions of chemical analyses. Wheat has been found to contain, in 100 parts, 12 to 35, barley 5 to 6, oats 4 to 8, rye 7 to 10, rice 3 to 4, corn 3 to 6, common beans 10, dry peas 3½, potatoes 3 to 4, red beet 1·3, common turnips 0·01, cabbage 0·8.

All of these proteinacious aliments—gluten, casein, albumen, and fibrin—as well as fat, starch, sugar, and gum, have been fed separately to dogs and other animals, in order to ascertain their nutritive properties. The animals all died of *starvation*, and physiological science profited—just nothing at all, unless it was from the mortality of the dogs! If animals were intended by nature to subsist on any *single element* of nutrition, consistency would seem to demand that such element should be accessible in some way except through the tedious process of culinary preparation or chemical analysis. Such *unnatural* dietetic experiments can only result in "cruelty to animals."

Gelatin is regarded by Dr. Prout as an imperfect kind of albuminous matter. Gelatin and albumen are, however, not convertible into each other by any known chemical process. Those tissues of animals called gelatinous—skin, tendons, cartilage, cellular and serous membranes—by boiling, yield a substance called gelatin; and this substance, with water, forms a tremulous mass, called *animal jelly*. The quantity of gelatin found in 100 parts of the following substances is: Muscles of beef 6, do. veal 6, do. mutton 7 do. pork 5, do. chicken 7, do. cod 7, do. haddock 5, sole 6, sweet-bread of calf 6, antlers of stag (hartshorn) 27, caviare (fresh) 0·5, spongy bones 39, hard bones 43 to 49, isinglass 70 to 93.

Gelatinous substances are moderately nutritious, but generally, in the form of stews, hashes, soups, etc., difficult of digestion, on account of the fatty matters they contain; gelatin easily becomes rancid and putrescent when exposed to a high degree of heat, and is then extremely offensive to the stomach. *Calf's foot jelly* is a favorite with physicians and invalids, but far inferior, dietetically or medicinally, to Indian or wheat-meal gruel.

A few years ago a Gelatin Commission was appointed in Paris for the purpose of ascertaining the nutritive virtues of bones and other refuse animal matter, with the view of providing a *cheap* diet for the poor! After a series of experiments, which caused a large number

of dogs to "bite the dust," it was finally concluded that gelatin alone would not sustain animal life—a conclusion that correct physiological principles would have settled without the experiments. As a specimen of the extremely absurd manner in which those experiments have usually been conducted, I quote the following from Pereira's "Food and Diet:" "M. Donné tried the effects of gelatin on himself. He took daily from 20 to 50 grammes (308½ to 771¾ grs. troy) of dry gelatin, in the form of a sugared and anomatized jelly, with either lemon or *some spirit;* and from 85 to 100 grammes (1312 to 1543½ grs. troy) of bread. At the expiration of six days he had lost two pounds in weight, and during the whole time was tormented with hunger, and suffered with extreme faintness, which was only alleviated after dining in his usual way."

Such "experiments" are not worth criticising, except to exhibit the foolish and frivolous manner in which those who assume to teach us physiology derive the facts which they parade with such flourishes in their "scientific" books. Any man accustomed to a "good dinner" every day, as the phrase is usually understood, and spirituous liquor with it, would suffer hunger, or, rather, craving and faintness, on first changing his dietetic habits to greater abstemiousness and simplicity, whether the change was to better or worse.

The gelatinous substances commonly employed in the preparation of jellies, solutions, etc., are *isinglass* and *hartshorn.* The former is procured from the *air-bag* or *swimming-bladder*, sometimes called the *sound*, of various fishes. The Russian and Siberian *sturgeons* yield the finest kinds for domestic purposes. *Blanc-mange* is a jelly prepared of Russian isinglass dissolved in milk, and flavored with sugar, lemon, etc. *Cod sounds*, procured from the common cod-fish, are used as a substitute for isinglass; the *glue* obtained by boiling cod sounds dries into a hard substance, and is used in the shops for gluing pieces of wood together. Glue is also prepared from the skins and hides of beasts and the bones of animals, for both dietetical and commercial purposes. The shavings of the antlers of the stag are employed in the preparation of the *decoction of hartshorn; hartshorn jelly* is made by boiling down half a pound of the shavings in three quarts of water to one quart, and flavoring with lemon, wine, etc. Jellies made from *calves' feet*, *calves' heads*, *cows' heels*, *sheep's trotters*, and *petit-toes* (sucking pigs' feet), are in great repute as delicate aliments for epicures and invalids. I regard them all as miserable trash at best.

The *salts* which are found to exist in very small quantities in vegetables and fruits constitute the *saline alimentary principle* of authors

Chloride of sodium (common salt) and the *earthy phosphates* are the most frequently found in vegetable aliments; and some chemists regard salts of potash and compounds of iron as indispensable constituents of our food, because they are generally found in the human body, and frequently in vegetable productions.

Perhaps there was never a greater and more general delusion abroad than that in relation to the nature, properties, and uses of common salt. It can be shown, with almost the certainty of a mathematical demonstration, that it possesses no nutrient properties, and is in no sense a dietetical article, nor in any sense of any possible use for any purpose of the animal economy; and yet medical writers are continually echoing the stale phrase, "that animals cannot exist without the free use of salt;" and this directly in face of the facts, that hundreds of species of animals never taste of salt, and that millions of the human race have lived healthfully, and died of a good old age, without employing it at all; and that, furthermore, hundreds of thousands of human beings now live in the enjoyment of excellent health, who have never used salt either as a food or a condiment. The stereotyped statements so frequently copied in medical books and journals are really amusing for their very absurdity. Pereira says: "It is a necessary article of food, being essential for the preservation of life and the maintenance of health." Dunglison says: "Salt is a natural and agreeable *stimulant* to the digestive function; a diet of unsalted aliment generating disease, chiefly of a cachectic character. Children who are not allowed a sufficient quantity of this *useful condiment*, are extremely liable to worms." Liebig says: "Salt is essential to the formation of bile in the herbivora, and to that of gastric juice." These expressions, and a hundred similar ones which could be quoted from as many authors, are purely fictitious, as is proved by the whole history of the animal kingdom, and the experience of a large portion of the human family. But let us look at the theory or philosophy of the matter.

Dr. Dunglison admits that salted meats are more indigestible than fresh, and he says also: "When highly dried they become more or less coriaceous, and of a texture very unfit for the due action of the gastric secretions." Dr. Paris thinks: "Salt combines with the animal fibre of salted meats, by which the texture is so changed as to render them less nutritive as well as less digestible." "Certain fish," says Dunglison, "when salted, as the *anchovy*, *cod*, *haddock*, *herring*, etc., are used as relishes in the way of condiments. They are *stimulating*; but the *combination of flesh and salt is very indigestible*, and unfit for the dyspeptic." Pereira says: "The antiseptic power of salt

is by no means well understood." Liebig says: "Fresh flesh, over which salt has been strewed, is found, after twenty-four hours, swimming in brine, although not a drop of water has been added. The water has been yielded by muscular fibre itself, and having dissolved the salt in immediate contact with it, and thereby lost the power of penetrating animal substances, it has on this account separated from the flesh. The water still retained by the flesh contains a proportionally small quantity of salt, having that degree of dilution at which a saline fluid is capable of penetrating animal substances. This property of animal tissues is taken advantage of in domestic economy for the purpose of removing so much water from meat that a sufficient quantity is not left to enable it to enter into putrefaction."

If Liebig's explanation be true—and I believe it is true, and it is corroborated by the experiments and opinions of other distinguished chemists—that the antiseptic property of salt is owing to its abstracting from the animal fibre its aqueous particles, thus rendering it less capable of solution and decomposition, it proves also that salt is antidietetic in the exact ratio that it is antiseptic, for digestion implies the decomposition and transformation of the elements of the alimentary substance. But some authors, among whom are Paris and M. Eller, have expressed the opinion, and proved it by experiments, that salt actually combines chemically with the animal tissues, thus effecting to some extent their destruction; hence a large quantity of it, or what is usually called the "free use of salt," cannot be otherwise than seriously injurious.

The following *awfully* convincing argument in favor of salted food is frequently quoted by "old school" writers on hygiene: "Lord Somerville, in an address to the English Board of Agriculture, refers to a punishment that formerly existed in Holland. The ancient laws of the country ordained men to be kept on bread alone, *unmixed with salt*, as the severest punishment that could be inflicted upon them in their moist climate. The effect was horrible; these wretched criminals are said to have been devoured by worms engendered in their own stomachs." Whether this story is fact or fiction, the principle applicable to its explanation is obvious enough. It is true that salt will kill many kinds of worms; and if the bread fed to the Hollander convicts was really a bad, rotten, *wormy* article, there can be no doubt that the addition of salt enough to destroy the vermin was a decided advantage.

The fondness of domesticated animals for salt is often referred to as evidence that the desire for salt is a necessary and natural instinct in all animals; and the fact that the deer of our forests seek the *licks* of

salt water, is adduced in evidence of the same natural instinct. But it should be remembered that domesticated animals have domesticated tastes, and that *civilized* horses, sheep, cattle, and hogs, are just as liable to acquire depraved appetites as civilized men. I have known cows to break into the "sap-bush" in maple-sugar districts, and drink themselves almost to death on syrup, yet no one would pretend that sugar, molasses, or treacle, was a natural food for cattle, except as it exists in the juices of vegetables. It should be observed, too, that the wild animals who frequent the salt water pools, only do so habitually in the warm season, when insects and worms are troublesome.

The *scurvy*, which is owing principally to a diet consisting of a large proportion of salted provisions, is a disease whose symptoms indicate an exceedingly impoverished state of the blood, and a putrescent condition of all the fluids and solids of the body. The *antiseptic* property of salt does not therefore render it wholesome. The truth is, the term antiseptic has no applicability to a living body or its aliment. It is a property which preserves dead organic matter in a fixed, unchangeable state; and so far as it affects any living tissue, it must deaden its vitality.

The dietetical rule for the employment of salt is very simple—*the less the better*. I do not suppose a very moderate quantity is harmful to any appreciable extent. A very little may be so diluted by the fluids of the stomach, and so readily washed out of the system as to occasion no important inconvenience. But if used habitually to the extent of provoking unnatural appetite and exciting thirst, it cannot be otherwise than prejudicial to the whole organic domain, occasioning glandular obstructions, rigidity of the muscles, producing general irritation of the mucous membrane of the alimentary canal, and loading the circulating fluids with a foreign ingredient, which the excretory organs must labor inordinately to get rid of.

So far as common salt and its elements (sodium and hydrochloric acid) exist in esculent fruits and vegetables, so far I admit they are alimentary. But it seems to me quite clear that nature has put the saline as well as the acid and alkaline elements of our food together in exactly the right proportions, so that the wants of the organic economy do not require us to make any extraneous additions.

Probably those who have never tried the experiment would be surprised to learn how easily the appetite for very salt food is overcome. Many persons, on restricting themselves to less than one fourth the usual quantity for one month, have found the palate as well satisfied as it was previously on four times the quantity. The diminution of quantity can then be carried still further without sacrificing much gustatory

pleasure, for, as the unnatural irritant is withdrawn, the sense of taste becomes proportionally keen, so that food, before unpalatable without high seasoning, is relished with little or none.

The remarks in relation to common salt are equally applicable to the dietetical nature of all other saline ingredients found in alimentary substances, although none of them are in use as condiments. The *phosphate of lime*, which is the basis of the bony structure, is found more generally in vegetables than any other salt. The earthy phosphates are found in one hundred parts of wheat 0·36 to 0·9, rye 0·06 to 4·18, barley 0·1 to 0·6, oats 0·16 to 0·6, rice 0·4, garlic 1·1, casein 6·0, milk 0·1975, blood 0·03, bones 45 to 56, muscular flesh of ox a trace, do. of calf 0·1, do. of pig a trace, do. of roe 0·4, do. of chicken 0·6, do. of trout 2·2, corn, potatoes, milk, and many other foods contain the earthy phosphates.

Minute quantities of the salts of potash are found in most vegetable foods, and in the blood, solids, and secretions of animals. The state in which the compounds of iron exist in the system, and the manner in which they are introduced, are entirely unknown; and it is questionable whether they are in any degree natural constituents of alimentary substances.

Aliments, or Foods Proper.—Having treated of the ultimate or chemical elements of food, and the proximate elements compounded of the ultimate, we come now to the consideration of aliments, or foods proper, which are compounds of the proximate elements. Pereira terms the proper foods "*compound aliments*," a name predicated on the mistaken notion that the alimentary principles were really *simple* aliments. He might as well call the oxygen and the hydrogen of the water we drink *aqueous principles*, and their combination in the form of water *compound drink!*

Whatever may be the natural dietetic character of man—a question to be discussed in the succeeding division of this work—both the animal and vegetable kingdoms are made subservient to his nutrition. Hence the obvious propriety of treating this branch of our subject under the general divisions of animal and vegetable food.

§. *Animal Food.*—Animal substances yield the alimentary principles called *proteinaceous*, *gelatinous*, and *oleaginous*, to which may be added the *sugar* of milk. They are derived from flesh, blood, bones, cartilages, ligaments, cellular tissue, viscera, milk, and eggs. All the species of animals which human power and ingenuity have been able to grasp—beasts, birds, fishes, reptiles, and insects, and every viscus or structure of each animal—brain, lung, heart, stomach, in

testine, kidneys, skin, etc., has been more or less employed as human aliment.

In the more civilized countries the mammals—*neat cattle*, *sheep*, and *hogs*, afford the principal supply of food; the *deer*, *rabbit*, *hare*, *elk*, *moose*, *buffalo*, and *bear*, belong to this class, and are used to some extent in many countries. Even the horse, dog, cat, rat, and mouse, are common food among the Kalmuck Tartars and some other tribes of the human family. Of *birds* those principally eaten are the common fowl, turkey, goose, duck, partridge, woodcock, and pigeon, though a great variety of other *game* birds are common at the refectories. The only *reptiles* which are much sought after in the United States are the various kinds of *turtles*, the most common of which are the *salt water terrapin*, *painted tortoise*, *broad terrapin*, *red-bellied terrapin*, *geographic tortoise*, *snapping turtle*, *soft-shelled turtle*, and the *green turtle*. The common *water-frog* and the *bull-frog* are occasionally eaten, and the *flesh of vipers* was once in repute as an analeptic or restorative diet for invalids. Of *fishes* our brooks, rivers, lakes, and oceans furnish an endless variety, from the *whale* of a hundred tons to the *shrimp* of a tenth part of an ounce. The *shell-fish* employed as food are the *lobster*, *crawfish*, *crab*, *prawn*, *shrimp*, etc.—the crustaceous; and the *oyster*, *mussel*, *cockle*, *whelk*, *scallop*, *limpit*, *periwinkle*, etc.—the mollusks.

The best animal *food* is, beyond all peradventure, that derived from the herbivora—beef, mutton, etc. Those animals which derive their nourishment directly from the vegetable kingdom will certainly afford a purer and more wholesome aliment than animals who subsist on other animals—the carnivora. Omnivorous animals, that eat indiscriminately vegetables or other animals, are far inferior to the purely herbivorous as food for human beings. Of the hog, whose filthy carcass is converted into a mass of disease by the ordinary fattening process, I need only express my abhorrence. Although swine flesh and grease, under the names of *pork* and *lard*, are staple and favorite articles of food throughout Christendom, common observation has long since traced the prevalence of scrofula, erysipelas, and a variety of glandular and eruptive diseases resulting from impure blood, to their general employment. If there are any animals which should be exterminated from earth, mad dogs and fattened hogs are among them. If, as Dr. Adam Clarke suggested at a dinner where a smoking roaster of a pig *graced* the table, the animal was "cursed under the law," how can it be blessed under the gospel? The flesh of animals that subsist exclusively on vegetable food contains a greater portion of nutritive matter, according to chemical analysis, than the flesh of any other animals

But the quality of the food derived from herbivorous animals may be greatly varied by circumstances. Very young or very old animals are less healthful than young, nearly full-grown, or middle-aged. Animals which have been excessively fattened, or stall-fed, and those which have been hard worked, are deteriorated as food; and animals that have been "slopped" with liquid preparations, the refuse matters of the kitchen, or the filthy excrements of distilleries, are very unclean and unhealthful.

There is also a choice in the different parts or structures of all animals when we come to the matter of converting them into the actual substance of the organs and structures of our own bodies. The very best part of any animal for any human being to eat is the lean flesh or muscular fibre; and that flesh is unquestionably the most wholesome which is found in animals neither fattened nor emaciated. But some allowance must be made for the masticatory ability of human teeth, "as society is now constituted." Flesh-meat requires thorough mastication. Human beings have not the tearing teeth of the tiger and the wolf, nor the cutting motion of the jaw which belongs to the carnivora. Moreover, the teeth, jaws, and gums of most people who live in the ordinary way are preternaturally sensitive and tender; and in addition to all this, a large portion of people, even young people, in civilized society, wear artificial teeth. They cannot, therefore, well masticate tough meat, as is often demonstrated in the cases of choking in the attempt to swallow half-chewed flesh. For this reason the animal had better be in good condition, and only the most tender fibres selected as food. Epicures generally have their flesh kept until it becomes tender from age; but such tenderness is the condition of incipient putrefaction, and although the article may be very easily disposed of by the teeth, and very quickly *dissolved* in the stomach, it can never be well *digested*, nor can it ever be converted into pure blood and sound tissues. It is advantageous to break up the fibres of tough meat by thoroughly pounding before cooking.

The process of decomposition commences in a dead animal the moment that life is extinct, although it may not be *offensively* apparent to our senses for some hours or days after death. And as living animals can derive no nutriment from any solid food except it be in its organized state, it follows that the flesh of animals as food deteriorates continually after the animal is killed; and hence the sooner butcher's meat is employed after being killed, the more wholesome. It may, however, be immediately frozen, and kept a long time without injury. The manner of slaughtering the animals also affects the quality of their flesh. They should always be *killed allopathically*—begging pardon of my "old-

school friends," if I have any—that is, *bled* in such a manner as to empty the vessels as cleanly as possible, and never *executed* by stunning, pounding, wringing the neck, etc. The blood not only contains the nutrient elements of the food, but the waste matters to be expelled from the body, and also such accidental impurities as may have obtained admission into the body; and the more bloody any kind of animal food is, the more unclean, putrescent, and unwholesome. Dr. Dunglison utters the following flat contradictions on the same page of his late work on Human Health. In speaking of the Roman custom of killing animals by running a red-hot spit through the body, he says: "This mode of slaughtering was replete with objections, if regarded in an alimentary point of view. The flesh of animals thus killed is dark colored, owing to the retention of blood in the vessels, and hence it becomes *speedily putrid.*" *Per contra*, says Dr. Dunglison: "When an animal is killed accidentally, *without bleeding*, its flesh is *not unwholesome*, although it may not be *palatable*, in consequence of the *blood remaining in the vessels.*" And yet again says Dr. Dunglison, as if to render confusion as confounded as possible: "The blood is the most putrescible of all fluids, and consequently animals, under such circumstances, do not keep sound so long as when they are bled to death." And yet once more says Dr. Dunglison: "Caution should always be observed in eating animals that have died from, or been killed during *disease.* Although the meat may often be innoxious, at other times it would *seem to be* capable of producing disease, and even death." The body of an animal dying from disease *may be healthful food*, says Dr. Dunglison. Of such thoughtless and senseless *gabble* is the great mass of medical and dietetical books afloat made up. The bloody drippings from broiled flesh which are so eagerly "spooned out" by many persons to season their potatoes, or "sop" their bread with, are always more or less charged with animal excrement, and never fit to be taken into the stomach, albeit some medical books prate about that stuff being the "juice" and "strength" of the meat!

The Mosaic law, which forbade the Jews to eat the blood of any beast or bird, or to partake of their flesh, unless the throat had been cut, in order to drain off the blood, was founded on correct physiological principles. As a further precaution against eating blood, they were required, previously to boiling meat, to let it soak half an hour in water, and then lie an hour in salt; the object of this proceeding was to draw out any remaining portion of blood the flesh might contain In regard to the philosophy of dietetics, Moses was far in advance of the majority of the Christian teachers of the present day.

The sausages sold in the shops under the name of *black pudding*

are made of pig's blood mixed with fat, seasoned with aromatics, and inclosed in the prepared intestines.

Brande and Schlossberger give the following proximate composition of muscular flesh:

100 Parts.	Water.	Albumen, or Fibrin.	Gelatin.	Nutritive Matter.
Beef,	74	20	6	26
Veal,	75	19	6	25
Mutton,	71	22	7	29
Pork,	76	19	5	24
Chicken,	73	20	7	27
Cod,	73	14	7	21
Haddock,	82	13	5	18
Sole,	79	15	6	21

The comparative healthfulness of other parts of animals can be readily determined by a reference to the physiological principles already adverted to. The fatty matters, next to the blood, are the worst alimentary substances; and, notwithstanding artificially depraved appetites generally crave unnatural aliment with an intensity proportioned to its impurity, such fact does not alter the truth, nor should qualify our manner of expressing it. The kidney, whose function is to eliminate from the body a large proportion of its most putrescent materials, though often considered a "dainty dish" by epicures, is certainly unfit to eat. A cooked kidney always exhales a urinous odor. The liver stands in the same relation to the human stomach. Next in the order of their unfitness are the brains, lungs, stomach, and intestines, skin, cartilages, tendons, etc. All these viscera and structures are made into a variety of fashionable dishes, and all have their admirers; but just as far as we depart from lean flesh in selecting aliments from the animal kingdom, just so far does their value depreciate.

The dietetic character of animal food is also affected by the manner of cooking. It is to be preferred lightly or but moderately cooked, providing a due degree of tenderness of fibre is secured. In broiled steaks this may be accomplished by pounding; but large, thick, roasting pieces are apt to be tough if not well cooked. *Broiling*, on all accounts, is the best method of cooking all flesh-meat. *Boiling*, taking care to skim off any floating particles of oil, is better than *roasting;* and this again is better than *frying*, which is a method never to be recommended.

Another argument may here be stated in favor of the position that muscular flesh is the best form of animal food, which is, the absolute identity of the chemical elements of pure flesh and pure blood. The analyses of Playfair and Boeckmann give the following result:

Elements.	Ox Blood.	Dry Beef	Roasted Beef.	Roasted Veal.	Roasted Deer.
Carbon,	51·95	51·83	52·590	52·52	52·60
Hydrogen,	7·17	7·57	7·886	7·87	7·45
Nitrogen,	15·07	15·01	15·214	14·70	15·23
Oxygen,	21·39	21·37	24·310	24·91	24 72
Ashes,	4·42	4·23			
	100·00	100·00	100·000	100·00	100·00

The *milk* of the mammals, though an animal secretion, can hardly be called animal food, in strict language. It contains, on the average, nearly ninety per cent. of water, and about ten per cent. of solid matter, consisting of butter, casein, sugar, and various salts. The *cream* of cow's milk, according to Berzelius, consists of butter 4·5, casein, or curd 3·5, whey 92·0=100·0. By agitation, as in *churning*, the globules of fatty matter unite, and form *butter;* the residue is called *buttermilk;* it consists of casein, serum, or whey, and a very small quantity of butter. *Skimmed milk* very soon becomes acid and curdy. The admixture of an acid or rennet (which is the infusion of the fourth, or true stomach of the calf), immediately coagulates it, separating the casein, or curd, from the whey. The addition of acetic acid will cause a still further separation of coagula, which has been called *zieger*, *bracotte*, etc. After the separation of casein and zieger, the whey left yields *lactic acid*, *salts*, and some nitrogenous substances, one of which is supposed to be *osmazome*. Osmazome, however, does not appear to be a tangible reality, but a flavor or effluvia developed by the chemical changes which take place in several animal substances during the process of cooking—heating, roasting, boiling, etc.

Good milk is a homogeneous but not viscid liquid, not coagulable by heat. When examined by the microscope it appears to consist only of transparent spherical globules. The cream yielded varies from five to twenty per cent., as tested by the *lactometer*, which, by the way seems to be a very unsatisfactory instrument for the purpose.

No secretion is so readily affected by the ingesta, or the general health of the animal producing it, as the milk. The taste, color, and odor of cow's milk are readily modified by the food. Children are easily salivated, narcotised, catharticised, and poisoned and disordered in many ways, through the mother's milk. The organic instincts, true to the *first* principle of self-preservation, determine the accidental impurities of the body to this channel as the most ready way of expelling them from the body. Nursing mothers have little idea how much disease, pain, and misery they inflict on their little ones, nor how fre-

quently they commit *infanticide*, by taking irritating aliments and drinks, and injurious drugs into their own stomachs. If I could present this subject to them in all its force, and in all its bearings on their happiness, and on the well-being of the human race, as I hope to attempt in a future publication, I am certain there would be a sudden and very radical revolution in the way of dieting mothers and doctoring children.

The milk produced by cows fed on distillery slops, which, to the disgrace of municipal authorities, *rich* men are permitted to sell to the poor in nearly all our large cities, is not only very innutritious, but absolutely poisonous. In New York, Brooklyn, and Williamsburgh, several thousand cows are kept in close and horribly filthy stables, fed on warm slops, and other refuse matters of the distilleries, which rot their teeth, weaken their limbs, and render their whole bodies masses of disease; and their milk is furnished to our citizens as a principal article of diet for their children!

Although milk cannot be considered a necessary or strictly natural food for mammals, except during the period of infancy, when the teeth are undeveloped—and no animals of the class mammalia, save man, employ it otherwise—it is nevertheless, when pure, the best form of aliment out of the strict order of natural foods. It contains all the elements requisite for prolonged nutrition, and except in certain abnormal states of the digestive organs, its moderate employment is attended with no inconvenience. Some invalids cannot enjoy, and some dyspeptics cannot tolerate it; but exceptional cases from morbid conditions are not rules for healthy persons.

Butter, as prepared for the table, is a different article dietetically from its fatty particles as they exist in milk. The former must rank with all animal oils, in being difficult of digestion, but slightly nutritive, and liable to generate rancid acids in the stomach. There is, however, a great difference between fresh-made and slightly salted butter, and that which is old and highly salted. Compared with the latter the former is almost innocuous. Melted and cooked butter is, wherever found, a very deleterious aliment. *Sweet cream*, from its solubility in water, and greater miscibility with the saliva, is far preferable to butter. Indeed, I am not aware that experience assigns to it any injurious or even unpleasant effects as an aliment.

The fresh curd of milk is perfectly wholesome, and pot-cheese, when made of milk as soon as it becomes sour, and before it gets bitter, is also a harmless article. Green cheese is not very objectionable, but old, strong cheese is one of the most injurious and indigestible things in existence. It is also one of the most constipating articles to

the bowels that can be found. It is a common *fancy* among medical men, and a common *whim* among the people, that old, strong, rank cheese, though itself very indigestible, stimulates the stomach to digest other things; hence almost all the medico-dietetical works quote the old adage:

"Cheese is a mity elf,
Digesting all things but itself."

There is more poetry than truth in the doggerel distich. Old cheese occasionally undergoes spontaneous decomposition, during which process acrid and poisonous elements are developed, as is frequently the case with bacon and sausages.

Next to the flesh of the herbivora, or rather the *graminivorous* animals, the *flesh of birds* affords the most wholesome form of animal food. All of the species of the feathered tribes in common use, however, are not equally wholesome. Their alimentary value depends in a great degree on their food and manner of life. Pereira says: "Rapacious birds, as the *hawk* and *owl*, are not eaten, partly, perhaps, from prejudice, and partly because those which touch carrion acquire a cadaverous smell." I should think the stench alluded to was a sufficiently *strong* reason for refusing to eat them, without imputing anything to the score of prejudice.

The *white-fleshed* birds—*chicken*, *turkey*, *partridge*, *quail*, etc.—are very nearly as nutritious and digestible as beef. Chicken flesh is called the "least stimulating of animal foods" by medical writers, but I think the assertion is wholly gratuitous. The *dark-fleshed* birds, as *game birds*, *grouse*, *robin*, *woodcock*, *snipe*, etc., are less nutritive and less digestible, but more greasy and savory to epicures. Pereira says of the flesh of these birds: "It is richer in ozmazome, and when sufficiently kept it acquires a peculiar odor, called *fumet*, and an aromatic, bitter taste, most sensible in the back. In this condition it is said to be *ripe*, or *high*, and is much esteemed as a luxury." This "fumet," so highly prized, is the stench of putrefaction, as is the "cadaverous smell" of carnivorous birds. Prof. Dunglison eulogizes this fumet still more extravagantly: "The solubility of game, grouse, etc., is amazingly increased, as well as the *luxury of the repast*, by keeping it until it has attained the requisite *fumet;* which indicates that *incipient putrefaction* is diminishing its cohesion." The *luxury of putrefying animal flesh* sounds strangely to those who do not go to epicures and "riotous livers" to learn their dietetic rudiments. It is unfortunate for the cause of human health and longevity, that physiologists do not consult nature and common-sense more, and cooks and refectories less, in seeking for the facts and principles of hygiene.

The aquatic birds, *geese* and *ducks*, are strong, rancid, and oily, and extremely unwholesome. The *canvas-back* is considered one of the greatest of luxuries; but here, as in a majority of cases, the luxury consists in the pampering of an exceedingly depraved appetite.

The manner in which fowls are fattened for the markets of many large towns, though it commends them to the tastes of epicures, detracts very much from their purity as food. They are confined in dark places, sometimes their eyes are put out or stitched up, and crammed with a paste made of barley-meal, mutton suet, molasses, and milk; this *ripens* them in a fortnight, when if they are not immediately killed, a fever or general inflammation comes on, which frequently destroys them.

Particular parts of certain birds have long been celebrated as "delicate morsels" by epicures; as the *brains* of the ostrich and peacock, the *tongues* of the nightingale and flamingo, the *trail*, or *intestine* of the woodcock, the *enlarged liver* of the goose, etc. This last article is a diseased condition of the liver, called by physiologists *fatty degeneration*, and is produced by confining the goose in a dark, warm place, and stuffing it with food and charcoal. Sometimes in this way the liver swells enormously, weighing two pounds. The body of the goose also becomes very fat, and in the language of Pereira, "excellent for the table." Pereira says of this morbid liver: "It is obvious, therefore, that these *diseased* livers must be difficult of digestion, and unfit for persons with delicate stomachs." Why should any persons, be their stomachs delicate or indelicate, eat "diseased" livers?

The *eggs* of oviparous animals, when fresh and rare-boiled, are moderately nutritious and easy of digestion. They are not particularly objectionable as a part of a dietary selection, yet their virtue is rather negative than positive. Poached eggs are extremely pernicious; and eggs are very indigestible when hard-boiled or fried. One writer, Mr. Pearson, states that there are "instances of laboring people, and persons who use violent exercise, with whom eggs, hardened by boiling or frying, *agree* better than in the soft or liquid state." It is not uncommon for laboring men to suppose that hard water agrees better with their stomachs than soft water; but no intelligent physiologist will think so.

The flesh of *turtles* is prepared at the refectories in the forms of steak and soup. It is unwholesome aliment in all ways, though Sir Hans Sloane, who appears to be as high authority among flesh-eaters as Hoyle is among chess-players, says, "the livers are counted delicacies." Sir Hans also tells us that the *callepee*, or under part of the breast or belly, baked is reckoned the best piece. Moreover,

Sir Hans remarks: "Persons who feed much on turtles sweat out a yellow serum, especially under the armpits." And again says our author: "The lard, or fat of the green turtle, when melted out, is of a warm yellow color, and communicates a yellow tinge to those who feed on it; whence their shirts are yellow, and their skin and face of the same color;" from all of which testimony we conclude that these reptiles are not fit for human beings to eat. The eggs of these animals are sometimes eaten.

In a general sense, *fish aliment* is far inferior to flesh. The piscivorous tribes of the human family are universally in a state of extreme mental and bodily abjection. The explanation of this fact is found in the food upon which the animals which they eat subsist—smaller fishes, worms, and insects, and the impurities of the element in which they reside—so far as salt-water fishes are concerned, which penetrate their structures, and mingle in all their fluids and secretions. Fish is not as nutritious as flesh, and is usually considered as less stimulating. The feverishness so generally noticed after a meal of fish may be imputed to the impurity of the aliment, though some regard it as evidence of stimulation. As a general rule the least oily fishes are the most wholesome, as the *cod*, *halibut*, *trout*, *whitefish*, *bass*, *blackfish*, *haddock*, *whiting*, *sole*, *turbot*, etc. *Salmon*, *eels*, *herrings*, *pilchards*, *sprats*, *mackerel*, *shad*, etc., are among the oily varieties. Dr. Dekay, in a late work, enumerates 440 species of fishes belonging to the State of New York, hence the varieties distributed over the aqueous portions of the globe must be innumerable.

The objectionable nature of fish aliment is generally made still more objectionable by the usual method of cooking—frying, and the indigestible additions of melted butter, lobster-sauce, egg-sauce, etc.

The idea has been extensively entertained that fish diet greatly intensifies the procreative powers, and Tourtelle refers to the numerous children found in seaports as proof. But there is no evidence that ichthyophagous people propagate faster than others. Were the opinion correct, it would afford another argument against the sanatory nature of the food; for it appears to be a law of the animal kingdom that the rapidity of propagation increases with the increase of the causes which destroy the animal.

The Egyptian priests were forbidden to eat fish, and among the aquatic animals which Moses prohibited to the Hebrews were, "Whatsoever hath no fins nor scales." A law similar to that of Moses was made by Numa Pompilius for the Romans. In tropical climates many species of fish are absolutely poisonous, especially at particular seasons, producing, when eaten, violent itching, colic, burning heat in the throat,

nausea, giddiness, blindness, cold sweats, often terminating in death. Dr. Burrows enumerates twenty kinds of poisonous fish. The nature of this poison is wholly unknown.

The fishes found in the clear water of lakes, rivers, and rivulets are greatly superior to those which inhabit muddy or foul waters. Some kinds of fish are eaten whole, as the *white bait*. Nearly all the parts and viscera of these animals are eaten more or less, not excepting the *milt* or *testicle* of the male, and the *roe* or *ovary* of the female. The former, called the *soft roe*, and the latter, called the *hard roe*, are among the "esteemed luxuries" of sensuous epicures. The *caviare*, which Dr. Dunglison calls "an article of national food," is the preserved roe of the sturgeon and various other fishes, salted, peppered, and further flavored with minced onions. The milt of the herring has been recommended by several distinguished physicians—Ritter, Neumann, Frank, Siemerling, and Hufeland—as a remedy for various diseases; and, what is specially amusing, its efficacy was ascribed to the *common salt* it contained!

Of the crustaceans, *lobsters*, *crabs*, *shrimps*, and *prawns*, are those most generally eaten. They are all exceedingly indigestible, and a frequent cause of disordered digestive organs. The peculiar odor and taste of these animals are due to a resinous substance of the membrane enclosing the shell, and which becomes red by boiling. Pereira says: "Both the crab and the lobster excite, in some constitutions, *urticaria*, or nettle-rash, and even colic."

Of the class mollusca, the *oyster* is the greatest favorite with the lovers of sea-food. They are not very nutritive, containing only about 12½ per cent. of solid matter. When eaten raw they are more digestible and wholesome than when cooked in any manner. Oysters have had the reputation among medical men of being a specific for dyspepsia, scrofula, and consumption, but the more intelligent physicians of the present day specially prohibit them in those diseases, except when they deem it policy to compromise with the appetites or prejudices of their patients. *Mussels*, *clams*, *scallops*, *cockles*, and even *snails*, are eaten to a considerable extent by people on the sea-coasts. The former are frequently poisonous. Dr. Lee states: "It is a very common thing for persons to be poisoned in this city (New York) by eating mussels produced from our adjacent waters." Eruptive and paralytic affections are said to be the results of being poisoned by these animals. The *vineyard* or *great snail*, has been, and still is, in England, not only a *popular* but a *regular* remedy for consumption. Fulvius Hirpinus, of Roman celebrity, had several *snail parks* in his garden, where he kept and fattened the "most famous and excellent" snails,

each variety having a park to itself. He fed them upon a pap made of sweet wine, honey, and flour; "and under this diet," says Dr Dunglison, "they became so *wholesome* and delicate, and were so much esteemed, that they were sold for eighty quadrants the dishful. I am of opinion that the wholesomeness of an aliment is not to be determined by the tastes of epicures, or its price in the market!

But few insects are employed as food among civilized people at the present day. The *grub-worm* was in repute as a "delicacy" in the days of Pliny. *Locusts*, *grasshoppers*, and some species of *spiders*, have been eaten. In South America *centipedes* are eaten. The Brazilian Indians are fond of the *white ant;* and the West Indian negroes relish a species of *caterpillar*. On the dietetic value of these insects I need not dwell.

§. *Vegetable Foods.*—The vegetable kingdom affords the purest aliments, as well as the greatest variety of alimentary principles. Vegetable foods are found in the form of the *seeds*, *fruits*, *roots*, *buds*, and *young shoots*, *leaves*, *flowers*, and *stems*, of flowering plants, and *lichens*, *ferns*, *sea-weeds*, and *mushrooms*, of flowerless plants.

The seeds and fruits are the most important and most useful of human aliments; yet it would be difficult to decide which of these is most necessary, for the perfection of nutrition requires both.

The seeds commonly employed are the cereal grains—*wheat*, *oats*, *barley*, *rye*, *rice*, *maize* or *Indian corn*, and *millet;* the leguminous seeds—*peas*, *beans*, and *lentils;* the cupuliferous seeds—*chestnuts*, etc.; and the oily seeds or nuts—*almonds*, *walnuts*, *hazel-nuts*, *butter-nuts*, *filberts*, *cashew-nuts*, *cocoa-nuts*, etc.

The most common alimentary fruits are the drupaceous or stone fruits—*peaches*, *nectarines*, *apricots*, *cherries*, etc.; the pomaceous fruits—*apples*, *pears*, *quinces*, etc.; the baccate or berried fruits—*currants*, *gooseberries*, *whortleberries*, *cranberries*, *grapes*, *elderberries*, etc.; the aurantiaceous fruits—*oranges*, *lemons*, *limes*, *citrons*, *shaddocks*, etc.; the curcubitaceous fruits, pepones, or gourds—*cucumbers*, *melons squashes*, *pumpkins*, etc.; leguminous fruits, legumes, or pods—of the *tamarind*, *bean*, etc.; the synochus fruits—*figs*, *tomatoes*, etc.; the sorosis fruits—*mulberries*, *pine-apples*, etc.; the etæno fruits—*strawberries*, *raspberries*, *blackberries*, etc.

In the order of roots, tubers, and subterranean stems, we have the *potato*, *turnip*, *carrot*, *beet*, *parsnip*, *artichoke*, etc.

Among buds and young shoots we find *onions*, *leeks*, *garlics*, *shallots*, *asparagus*, etc.

Leaves and leaf-stalks furnish us *cabbage*, *spinach*, *cauliflower*, *broccoli*, *cowslips*, *milkweed*, *turnip tops*, *potato tops*, *dandelion tops*, *let-*

tuce, *mustard tops*, *endive*, *water-cress*, *common cress*, *celery*, *rhubarb*, *sorrel*, *plantain*, etc.

Of the receptacles and bracts, the flower-heads of the garden artichoke are the best known.

The stems of several palms yield a farinaceous food, as sago. The pulpous stems of a *fern-tree* in New Zealand are eaten, and esteemed an excellent vegetable.

The tuberous rhizomes of ferns, in Polynesia and other parts of the world, yield a farinaceous matter, which is occasionally employed as food.

Many lichens, of which *Iceland moss* is the most familiar example, are used dietetically and medicinally.

Several species of algæ or sea-weeds—*Irish moss*, *Ceylon* or *Jafna moss*, etc., are also employed both as food and medicine.

Several species of the fungi or mushrooms are considered edible. The best known among them are the *field mushroom*, *boletus*, *morel*, *truffle*, *pepper dulse*, and *tangle*.

Of the *cereal grains* wheat and rice are the most extensively cultivated. Although they possess about an equal amount of alimentary properties, the wheat is far superior as a single article of diet. Those who employ a diet mostly of rice require a larger proportion of succulent fruits, or watery vegetables, or ligneous matter, as leaves, roots, etc., than those who subsist principally on the whole grain of wheat, for the reason that the latter contains in the bran a much larger proportion of lignin. But even wheat is too nutritious and concentrated of itself, and requires the admixture of a due proportion of fruits, or other succulent and, comparatively, innutritious vegetables.

It appears to be a confirmed habit among dietetical writers and medical practitioners to write and speak of animal food, as compared with bread and other preparations of the grains, as being more "nourishing," more "substantial," etc., in the face of all human experience and all chemical investigation, which prove the latter to contain at least three times as much nutriment in a pound as can be obtained from the best flesh-meat. Those tribes of men, laborers, hunters, etc., who subsist almost wholly on flesh, fish, or fowl, devour on the average about seven pounds per day; while those persons in similar circumstances and occupations who subsist almost exclusively on farinaceous vegetable food, eat but little more than one pound. In fact, the quantities of animal food consumed by some human beings, who are carnivorous in practice, seem almost incredible. Captain Parry relates the case of an Esquimaux *lad*, who, at a meal which lasted *twenty hours*, consumed 4 lbs. raw sea-horse flesh, 4 lbs. broiled ditto, 1¼ pint

gravy, besides 1¾ lbs. bread, 3 wine glasses raw spirits, 1 tumbler strong grog, and 9 pints of water. Captain Cochrane states, in a "Narrative of Travels through Siberian Tartary," that he has repeatedly seen a Yakut or Largouse eat forty pounds of meat in a day! It is stated that the men in the service of the Hudson's Bay Company are allowed the daily rations of seven or eight pounds of ordinary flesh-meat.

The world is full of examples of laboring individuals, even in cold climates, subsisting on coarse bread, not exceeding the average amount of one pound of wheat, rye, or corn daily; and the millions of China and India subsist on much less than that quantity of rice, with only animal or other food enough to amount to a condiment or seasoning.

For the purpose of making *raised* or *fermented* bread, wheat is superior to all other grains, on account of its large proportion of gluten. The wheat of hot climates, as a general rule, contains more gluten than that of cool climates. The Southern or *red wheat* of this country is more glutinous than the Western or *white wheat;* hence the Southern flour is called *stronger* by the bakers, and is capable of being puffed up into the largest, and, for the manufacturers, the most profitable loaf. Wheat also proves more palatable to a majority of people in its various forms of preparation than any other grain. Boussingault gives the following analysis of wheat, rye, and oats, which makes them almost identical in chemical constituents. The other grains cannot differ essentially from these:

Ultimate Elements.	Wheat.	Rye.	Oats.
Carbon,	46·1	46·2	50·7
Hydrogen,	5·8	5·6	6·4
Oxygen,	43·4	44·2	36·7
Nitrogen,	2·3	1·7	2·2
Ashes,	2·4	2·3	4·0
Total,	100·0	100·0	100·0

The proximate constituents of the grains are: *Starch, albumen, fibrin, gluten, mucin, sugar, gum, oil, lignin, earthy phosphates,* and *water.*

The methods by which wheat is prepared for the table are very numerous. The *very best* is unquestionably the *unleavened wheat-meal bread.* The yeast *brown bread* ranks next in wholesomeness. *Fine bread,* made of flour, with the addition of a quantity of rye-meal, or coarse-ground Indian meal, or both, is an excellent article. The common *superfine bread,* especially as prepared for the market by the

bakers, is the lowest order of bread-kind in the scale of healthfulness. All the bakers' bread with which I am acquainted—and I have examined it very extensively—is over-fermented, by which much of the starch as well as the sugar is destroyed, and more or less of the gluten decomposed, and converted into acetic acid, which acid is neutralized by ammonia, or other alkaline matters. This is the reason that stale bakers' bread is so unpalatable after it is fairly cold, while good domestic bread preserves its sweetness and flavor for a week or two. Universal experience as well as physiological science pronounced all *fresh* fermented bread unwholesome. Fermented bread is never fit for the stomach until it has been twelve hours from the oven, and is not in its best condition under twenty-four hours. There are two reasons why new bread, when fermented, is prejudicial to the digestive organs. Its texture being soft, spongy, and adhesive, it is not well masticated and insalivated; and again, the process of fermentation not only develops the carbonic acid gas which raises the dough, but also converts a small portion of the elements of the saccharine matter into alcohol; this alcohol is probably not perfectly dissipated by the heat of the oven, nor until the bread has been many hours from it. To make the best bread it is essential to have a good article of flour—if fresh-ground the better—fine, fresh, sweet yeast; the dough must be well kneaded, so as to diffuse the yeast equally through the mass; the loaf must be placed in the oven the precise moment when it is sufficiently light, or it will be *heavy* from deficient, or *sour* from excessive fermentation, and baked in a brick oven from an hour to an hour and a half, according to the size of the loaf. Very good yeast bread may be baked in a stove or kitchen-range by observing carefully all the above conditions.

Wheaten grits (cracked wheat), an article rapidly getting into popular favor through hydropathic auspices, simply boiled, make an excellent dish, seasoned with a little sugar or milk. For children there is nothing in the world superior, from the very moment they are able to take any food except the mother's milk. I know it will almost horrify some good mothers and kind nurses to be told that cracked wheat, "bran and all," is proper aliment for the delicate, susceptible stomachs of little infants; while many a college-bred M.D. is ready to declare that such coarse, rough, *scratchy* food is enough to tear its tender bowels all to pieces; and I know, too, that the great "standard authors" of the medical profession, and all their little echoes throughout the country, proclaim the bran part a "mechanical irritant;" and yet I know the assertion I make to be true. Let those who oppose this kind of diet for children, if they can, give some *rational* reason why thirty children per week in the city of New York die of the disease called *convulsions*

a disease whose almost exclusive cause is obstruction, or constipation, and this condition being almost universally produced in them by the various preparations of fine flour. *Farina*, formerly called *pearl wheat*, contains more of the ligneous, or branny property, and is hence far preferable to fine flour for mush or pudding. *Semolina*, *soujee*, and *mannacroup*, are also granular preparations of wheat similar to farina, considerably employed in England. *Maccaroni*, *vermicelli*, and *caglivari paste*, are pasty preparations of wheaten flour. *Hot rolls* are rendered tender and brittle by excessive fermentation, but are, for the same reason, very indigestible and unhealthful. *Rusks*, *tops*, *bottoms*, *buns*, etc., are fermented, and for the same reason unhealthful when fresh; they are also less digestible from the additions of butter, sugar, and milk. *Gingerbread* is made extremely light by means of carbonic acid gas, but the combination of *flour*, *treacle*, *butter*, *alum*, and *potash* is a serious objection to its wholesomeness. The common *sea-biscuit*, or *ship-bread*, is made of either wheat-meal, or flour containing a considerable proportion of bran, simply mixed with water, and baked. It is hard and compact, and very wholesome. *Wheat-meal crackers (Graham crackers)* when made without shortening, and not over-fermented, are a good article for exercising the teeth, and promoting the salivary secretion.

Cakes, in almost endless variety, are made of superfine flour, butter, lard, sugar, eggs, with spices, essences, fruits, or alcoholic liquors, for seasonings. Of course they are pernicious, as a general rule, according to their complexity. *Plum-cake* is a fair specimen of the average character of the cakes of cook-books and popular recipes. All dietetic writers of any respectability agree as to its unfitness, while the common *fruit-cake* and *wedding-cake* are as universally regarded as exceedingly indigestible trash. *Pancakes*, or *fritters*, are fried in hog's lard. *Griddle-cakes*, made of wheat-meal, or of flour and Indian meal, or of rice or buckwheat, are a tolerable article, provided they are cooked on soapstone griddles without grease. A very palatable and comparatively wholesome cake may be made of wheat-meal, sugar, and sweet-cream, or good rich milk in place of the cream. Those who become accustomed to unbolted farinaceous food, will generally prefer this kind of cake to that made of fine flour, even as a matter of taste.

Puddings are sometimes made of wheaten flour; but no form of boiled flour can be very digestible or wholesome. *Bread puddings* are the best of these preparations; *hasty* and *batter puddings* next in the descending scale. The *plum* or *suet pudding* is one of the most pernicious compounds ever invented; it is generally made of bread crumbs, currants, raisins beef suet, salt, citron, eggs, sugar, mace, and

nutmeg, and eaten with butter, sugar, and wine for sauce. *Dumplings* are another form of boiled flour and fruit; they can be made so as to be tolerably light and digestible, but as usually served up at refectories they tax the digestive powers very severely.

Considerable attention has of late years been given by bread-makers to various methods of manufacturing raised bread without yeast; employing in its stead acids and alkalies, usually hydrochloric acid and sesqui-carbonate of soda. If the proportions of these articles are exactly balanced, and their admixture with the dough carefully managed, the acid, uniting with the alkali, forms common salt, while carbonic acid gas, without leaving any free acid or alkali, is set free to raise the dough. A variety of other experiments have been tried in this country and in England, but I believe they have never succeeded in realizing quite as good an article as can be made with the best of yeast, skillfully managed. Two years ago one of our city bakers commenced the manufacture of bread raised with an acid and alkali. The baker conscientiously supposed his article to be more wholesome than the ordinary fermented bread, but wishing to be well assured of the fact, he submitted specimen loaves to the medical gentlemen of the New York Academy of Medicine, requesting a professional opinion concerning its hygienic character. The Academy referred the matter to a special committee, but there it rested; and notwithstanding the urgent importunities of the manufacturer, the Academy has not even yet seen fit to express any opinion.

Oats have been extensively used as food by the people of Scotland and the northern parts of England, and to some extent in this and other countries. The entire seeds of oats contain, in 100 parts, about 66 of meal to 34 of husk. 100 parts of dried oatmeal yielded, according to Dr. Christison's analysis: *Starch* 72·8, *sugar and mucilage* 5·8, *albumen* 3·2, *oily-resinous matter* 0·3, *lignin, or bran* 11·3, and *water* 6·6. *Oatmeal* is prepared by grinding the kiln-dried seeds, deprived of their husk and outer skin. *Groats* are the grains deprived of their integuments.

Oatmeal is usually employed in the form of *mush*, *porridge*, or *stirabout*, prepared by simply boiling in water, and *oat-bread*, or *oat-cakes*, made by rolling the dough into very thin cakes, and baking it before the fire, or in a stove or oven. These preparations are more wholesome than those of fine wheaten flour, because they contain a larger proportion of lignin, or bran, and are hence more laxative, or rather less constipating. Persons unaccustomed to oatmeal sometimes complain of acidity after eating it; but such a result may occur on first eating any kind of grain to which the stomach has not been habituated

it is, however, more frequently noticed with respect to rye and corn than the other grains.

Barley is but little used as human food in modern days, the breweries converting nearly the whole crop of the world into the poisons called *malt liquors*. It is, however, far from being the most inferior of grains, either in chemical constituents or physiological properties. The *seeds* of barley contain, in 100 parts: Meal 70·05, husk 18·75, water 11·20. 100 parts of *barley-meal* yield: *Starch* 67·18, *fibrous matter* 7·29, *gum* 4·62, *sugar* 5·21, *gluten* 3·52, *albumen* 1·15, *phosphate of lime with albumen* 0·24, *water* 9·37.

Various preparations of barley are in repute for the sick-room. Pereira considers *barley-water* as a "*light, mila, emollient, demulcent* liquid, *slightly nutritive*, and very *easy of digestion*;" a rare combination of medicinal virtues, truly, for steeped seeds of grain to possess! Less learning would be displayed, but more intelligence communicated, by calling the water in which a little barley-meal had been boiled *diluent* and *nutritive*, the former being the property of the water, and the latter the property of the grain. *Scotch*, *hulled*, or *pot barley*, is the seeds deprived of their husks; and when these seeds are rounded and polished they constitute *pearl barley*. *Patent barley* is the farina obtained by grinding the pearl barley to powder. Barley contains too small a quantity of gluten to make good bread by panary fermentation.

Rye is considerably employed as food among the inhabitants of northern Europe, and in New England. In Germany and Sweden it is the principal ingredient in bread. The entire *seeds* of rye yield, in 100 parts: *Meal* 65·6, *husk* 24·2, *water* 10·2. *Rye-meal* contains, in 100 parts: *Starch* 61·07, *gum* 11·09, *gluten* 9·48, *albumen* 3·28, *saccharine matter* 3·28, *husk* 6·38. *Rye-meal* mush is somewhat more laxative to persons unaccustomed to it than wheat-meal mush, and is a valuable food in constipation and torpid bowels.

Buckwheat is sometimes employed in bread-making. In Germany and France it is in common use for pottage and puddings; and in the United States it is extensively cultivated, and eaten in the form of griddle-cakes. It is not in itself objectionable; but the melted butter and sugar with which buckwheat cakes are seasoned, and the burned grease used in cooking them render them exceedingly noxious. The *itching* and *skin diseases* generally attributed to buckwheat, are really chargeable to its accompaniments—pork gravy, sausages, butter, sugar, etc.

Rice is the principal grain of India, China, and most Eastern countries. It is also extensively cultivated in the West Indies, Central America, the southern countries of Europe, and the southern parts of

the United States. The composition of *Carolina rice* is, according to Braconnot, in 100 parts: *Starch* 85·07, *woody fibre* 4·80, *glutinous matter* 3·60, *oily matter* 0·13, *sugar* 0·29, *gum* 0·71, *phosphate of lime* 0·40, *water* 5·00, with traces of *acetic acid*, *phosphate of potash*, *chloride of potassium*, and *vegetable salts of potash and lime*.

In nutritive properties rice does not differ materially from wheat, although it is much less adapted to prolonged nutrition as an exclusive article of diet, because of its small proportion of lignin or bran. From the fact that the cholera first appeared in a rice-growing country, and has prevailed extensively in countries where this grain is the principal food of the inhabitants, a suspicion has arisen that a rice diet was among the causes of cholera. Although a rice diet alone would be incapable of producing such a disease, there can, I think, be hardly a question that a diet almost exclusively of rice would produce a predisposition, enabling other sources of impurity and debility readily to develop the disease. In fact, this principle is fully illustrated by the phenomena of cholera and bowel complaints as they appear in this country. The ordinary employment of concentrated farinaceous foods with us (food containing too small a proportion of what is called innutritious matter, to keep the excretories free and unobstructed) absolutely produces a general predisposition to bowel complaints, only requiring some disturbing agent of the nature of an exciting cause, to induce diarrhea, dysentery, cholera morbus, cholera infantum, inflammation of the bowels, or Asiatic cholera, according to the combination of all the predisposing and exciting influences. Obstruction, constipation, irritation, and inflammation always result, unless due relations between bulk and nutriment are maintained in our aliments; and hence the more concentrated or nutritive the grain or flour we employ, the greater should be the proportion of the less nutritious vegetables and succulent fruits. An immense amount of disease, suffering, decrepitude, and premature death result from a misunderstanding of, or inattention to, this simple and obvious principle; and the advice emanating from medical men, boards of health, medical councils, etc., in cholera seasons, recommending the people to abstain from fruits and vegetables, and eat principally rice, superfine flour, dried beef, smoked herring, etc., has destroyed many lives and saved none.

The best preparation of rice is that of simple *boiling*; it should not be stirred sufficiently when cooking to break up or mash the seeds. *Rice, milk*, and *sugar* make one of the best plain puddings. *Rice griddle-cakes*, which contain eggs and sugar, are somewhat offensive to all stomachs, and especially so to dyspeptics.

The various remarks which medico-dietetical writers have perpetrated

concerning the nature of rice as an aliment, afford some amusing examples of the loose and thoughtless manner in which men may reason when they have no settled principles to reason from or upon. Thus says Dr. Dunglison, in allusion to the constipating effects of rice upon the bowels: "Perhaps the cause of its having astringent properties assigned to it is its *long retention* in the stomach when that organ is debilitated. This is probably owing to its possessing but little *stimulating power*." Was ever greater nonsense uttered! Again, says Dr. Dunglison: "Formerly the idea prevailed that rice, *when habitually eaten*, is possessed of poisonous properties"—as though its *nature* depended on whether we eat it constantly or occasionally! Bontius thought that the use of rice tended to the production of blindness. Probably he was not aware that disordered vision, giddiness, etc., is a very common effect of too concentrated food and of excessive alimentation in all countries.

Maize or *Indian corn* is extensively employed as food in America, Asia, and some parts of Europe. Its proximate composition in 100 parts, as analyzed by Dr. Gorham, is: *Starch* 77·0, *zeïn* (a substance somewhat resembling gluten) 3·0, *albumen* 2·5, *gum* 1·75, *sugar* 1·45, *extractive matter* 0·8, *cuticle and ligneous fibre* 5·0, *phosphate*, *carbonate*, and *sulphate of lime*, nearly 1·5, *water* 9·0. In nutritive power and wholesomeness maize is but little inferior to wheat. It has not enough of the glutinous property to make light loaf bread alone, but makes an excellent bread with the addition of a portion of wheat-meal or wheaten-flour. The *coarse-ground* meal is incomparably superior to the fine-ground for all cooking purposes. *Samp* is made by boiling the broken grains until soft; *hominy* is a preparation of the grain between samp and meal; and *Indian mush* is the boiled meal. These are all excellent dishes as a part of a dietetic course. *Corn*, *Indian*, or *Johnny cakes* are made by wetting the meal with water, or milk, or both, and baking in a stove, oven, or before the fire. The Indian method of baking under hot ashes is, for healthfulness, still better. Sometimes these cakes are sweetened and raised with *sour milk* and *bi-carbonate of soda*. This preparation is not as wholesome as the former, but far superior to most of the *sweet-cakes* made of fine wheaten flour. *Saleratus* is very generally employed in this country in nearly all kinds of Indian or wheaten cakes, but it is a most pernicious article. For *plain puddings* the coarse Indian meal, or hominy, is the best article, excepting, perhaps, wheaten grits and rice. Milk and sugar are all the seasonings wanted to make as rich a pudding as human appetites *ought* to desire.

Our New England mothers and grandmothers had a method of

making a most delicious and salutary bread, without raising or fermentation, in which Indian meal was the chief ingredient. Due portions of the meals of corn, rye, and wheat were kneaded into a rather soft dough with water or milk, and *baked all night* in an iron bake-kettle, which was well covered with coals and hot ashes. In the morning an article "fit for a king" and all other "lords of creation," was brought forth from the baker. Such mothers would be godsends to the puny children of this degenerate age.

Dr. Lee says: "A pound of corn, when cooked, makes from two and a half to three and a half pounds of food, and this will suffice for the daily support of a laboring man. If an individual could be supported on this alone, his annual expense for food would be but $3 65, or say $15 to a family of five. The average cost of potatoes may be put at about half a cent a pound, and allowing five pounds per day to an adult individual, the expense will be about $9 a year. When we consider that it is not unusual for land to yield one hundred bushels of corn to the acre, or thirty tons of potatoes, we may form some estimate of the population which this country is capable of supporting from the produce of the soil."

We may see the munificence of the Creator, in making provision for all our *natural* wants, in a stronger light by varying the calculation. Let us suppose an acre of land planted with corn, half an acre with potatoes, and good apple-trees surrounding the whole—all to be in the best state of cultivation. We would then have a combination of foods capable of fully sustaining the organism in its highest integrity; and nutrition enough from an acre and a half to sustain at least thirty human beings.

Millet or *hirse* is less employed than any other cereal grain. It is cultivated in some places as a garden plant, and used in cooking puddings, seasoning porridge, etc.

Peas, *beans*, and *lentils* possess nearly the same proportions of ultimate chemical constituents as the cereal grains. In proximate composition they are more oily and amylaceous. They are most digestible when green and fresh. When dried and old they produce more or less flatulence, and sometimes colic in persons accustomed to a concentrated or stimulating diet. This objection, however, is generally soon overcome in those who adopt a plain and correct dietary system. Not a little of the indigestibility charged upon the lugiminous seeds is justly due to the grease, butter, and seasonings with which they are usually cooked and served.

The *nuts* or *kernels* are generally oily, and, to most stomachs, indigestible. The chestnut, however, contains no oil, and when cooked is

pleasant and considerably nutritive; it is employed as a staple article of food in some countries. It is at least probable that all, or nearly all, of the nuts are in themselves natural and wholesome food; their indigestibility resulting from the abnormal state of the digestive organs we have produced by our artificial and enervating habits of life. *Bitter almonds*, though extensively used by cooks and confectioners, contain poisonous properties; the volatile oil obtained from them is a more potent poison than Prussic acid.

At the head of the *fruit kingdom* stand the apple-tree and the grape-vine. Many other fruits are as wholesome in their season, and some are more nutritive, but none are so hardy and enduring, nor capable of such extensive cultivation. The varieties of the apple that can be produced are almost innumerable. The sweet, subacid, and mealy kinds are the most nutritious. If well grown and fully ripe they may be eaten in the raw state, roasted, or baked, with nearly equal advantage as a part of the meal, or they may be stewed and sweetened. They can also be preserved by drying, or in their own inspissated juices, the year round.

Unfortunately, grapes are cultivated much more for the purpose of manufacturing intoxicating wine, than for human sustenance. An argument in favor of this use, or rather abuse, of the fruit of the vine, has been predicated on the opinion somewhat prevalent, that wine-growing countries were the most temperate ones. But Dr. Bell, M. Villerme, M. Perier, Mr. Bulwer, and other standard writers, have shown this opinion to be an error. In France nearly one thousand millions of gallons of alcoholic drinks were consumed in 1830, of which wine constituted more than half. Several Americans who have resided in Paris testify that "drunkenness is the prevailing curse of the laboring classes of France."

Of the different varieties of grapes the *Isabella* and *catawba* are more generally cultivated in this country; the former of these is most common in our markets, and most highly esteemed. Dried grapes are called *raisins*. The *muscatels* and *blooms* are sun-dried. Sometimes the grapes are dipped in a mixture of water, ashes, and oil, and afterward sun-dried, by which treatment the juice exudes and candies on the fruit. The *small* or *Corinthian raisin* is the *black currant* sold at our groceries.

There is an old adage which says, "Fruit is gold in the morning, silver at noon, and lead at night." The proverb is founded more in our artificial habits than in nature. Those who are accustomed to a plain vegetable diet can take fruit with equal pleasure and profit at either meal. But stomachs weakened by enervating drinks or con-

centrated aliments can tolerate fruits much better in the fore part of the day.

The opinion is common that the fruits produced in different climates or localities are most suitable for the inhabitants residing there. Unquestionably this is true so far as quality and maturity are concerned; for most kinds of fruit being exceedingly perishable, are of necessity gathered before fully ripe, when they are to be transported on long voyages. For this reason many of the peaches and strawberries brought to the New York market are far inferior, both in flavor and dietetical virtues, to those picked and eaten where they are raised.

Almost all persons can use nearly all sorts of fruits in our markets, excepting, perhaps, the very acid kinds, with freedom and advantage, providing they are well grown, perfectly ripe, and are eaten only at meals. Those persons with whom they *seem* to disagree should gradually accustom themselves to their employment—eat a very little at first, and increase the quantity as the stomach will bear. We have many varieties of *pumpkins* and *squashes*, which are not only excellent for pies, but make a delicious sauce. The only cooking they require is to be well boiled. As a general rule, those of the firmest, heaviest texture are the best flavored and most nutritious.

Of the edible roots the *potato* holds the first rank. It is nearly or quite as nutritious as the best flesh-meat, and in ultimate chemical composition is almost identical with the cereal grains, containing, in 100 parts: *Carbon* 44·0, *hydrogen* 5·8, *oxygen* 44·7, *nitrogen* 1·5, *ashes* 4·0. Its proportion of solid matter is 24·1 to 74·9 of water. The potato alone is capable of sustaining the prolonged nutrition of human beings, as has been verified by repeated experiments. *Potato starch* is extensively sold under the names of *potato flour*, *English arrow-root*, *corn starch*, etc. A mixture of potato starch and chocolate has been sold in England under the name of *Bright's universal sanative breakfast beverage.*

Two or three years ago Professor Mülder entered into a profound philosophical contemplation of the nature and properties of the potato, and came to the conclusion that its use, "as an article of food, was the principal cause of the physical and mental degeneracy of the people of those nations who employed it." The learned professor had undoubtedly mistaken the effects of intoxicating liquors, tobacco, and many other noxious agents, for those of the innocent potato.

The *Carolina* or *sweet potato* contains considerable saccharine matter, and is equally digestible and wholesome as the common or Irish potato, making due allowance for habit. When boiled until soft, but

without destroying their shape, potatoes are probably more nutritive and wholesome than when prepared in any other manner.

Potatoes have long been celebrated as a preservative against the scurvy; and it has puzzled physicians exceedingly to determine in what particular part or element this antiscorbutic property resided. Some have ascribed it to citric acid. I am of opinion that this virtue resides equally in every part of the tuber, and that its preventive power in this disease is due to its healthfulness as an article of food, and not to any particular *medical* property. In fact, all good fresh fruits and vegetables are antiscorbutic.

With regard to the other esculent roots, *turnips*, *parsnips*, *beets*, *carrots*, etc., they are of but little value in an alimentary point of view, yet useful in preserving the due relations of bulk and nutriment with those who partake of a large proportion of farinaceous food. To most stomachs they prove more or less flatulent, but this depends very much on the vigor of the digestive powers, and the other dietetical habits. A perfectly healthy stomach can manage them without any difficulty.

Of the cruder vegetable products the *cabbage* is the most nutritive It contains considerable nitrogen as well as sulphur. An Edinburgh physiologist—Dr. Johnson, I believe—has lately "discovered" that it possesses more muscle-making property than wheat; but his inference is drawn from the mistaken opinion that foods are nutritive to muscular tissue in proportion to the nitrogen they contain. As cabbage contains more than ninety per cent. of water, its nutritive power must be less than ten per cent., while we know wheat possesses from eighty to ninety per cent. of nutriment.

Pot-herbs, including *cabbage*, *spinach*, *asparagus*, and a variety of *leaves*, *leaf-stalks*, *stems*, *young roots* and *shoots*, *receptacles*, *bracts*, *flowers*, etc., are generally grateful and wholesome; always so to healthy stomachs. If they ever prove injurious, it is from the melted butter, oil, vinegar, etc., with which they are too often cooked and eaten. These aliments, too, prove flatulent to many stomachs; and the rule already mentioned is applicable to these and all other crude and watery vegetables. Delicate stomachs must get gradually accustomed to their use, if they would avoid unpleasant effects. *Salads* are usually eaten with mustard, vinegar, pepper, salt, and oil, and are objectionable mainly on account of the seasonings. *Lettuce* contains the narcotic principle of opium, and is injurious on that account.

Most of the fruits herein mentioned, and some of the vegetables, are employed in making pies and pastry. As usually prepared by the baker, they are of course exceedingly pernicious, for however delicious

and wholesome the fruit of itself may be, the crust is far otherwise. But excellent, and delicious, and even healthful pies can be made of the mild-flavored or sweet fruits, simply sweetened, with a crust of wheat-meal or fine flour, shortened with potatoes, and seasoned with new milk or sweet cream.

Condiments, or *seasonings*, though not in any sense alimentary substances, are so commonly employed with almost all articles of food, that they deserve a moment's notice in this connection. Those in general use, in addition to salt and vinegar, already discussed, are *mustard*, *cayenne*, *black pepper*, *allspice*, *cinnamon*, *cloves*, *mace*, *nutmeg*, *horse-radishes*, *ginger*, etc.; various other pungent and spicy substances are frequently employed. They all tend to blunt the organic sensibilities, and the more acrid are extremely irritating to the whole mucous surface. Though the majority of dietetical writers commend them, and nearly all medical writers declare them to be indispensable, I know of but one physiological rule in relation to them—*the less the better.* It is true that an appetite partially palsied by their use, cannot appreciate the flavor of aliments without them; and stomachs accustomed to digest under their irritation, will not at first work as satisfactorily in their absence, but the same rule obtains with regard to liquor, tobacco, or any other artificial habit. *Hunger* is the only natural sauce; and those persons who can summon moral and animal courage sufficient to abstain from acrid seasonings of all kinds, will find, in a short time, that the God of nature has made all the foods He has intended we should eat extremely palatable, without endowing them with any properties to provoke our appetites to the injury of the vital domain. He made the food savory enough for us to "eat to live;" if we over-season it, we may soon find ourselves too closely allied with those who "live to eat," to have pure appetites or sound health.

CHAPTER V.

OF TEMPERATURE.

VICISSITUDES OF WEATHER.—The wonderful power of the living organism to develop, maintain, and regulate its own heat, enables human beings to exist in great extremes of climate, and exposed to numerous and sudden vicissitudes of weather. Franklin, Parry, Ross, Back, and other northern navigators, have been exposed for months

together to a temperature varying from 50° to 70° below zero, while in the oasis of Mourzouk, and many parts of the tropical zone, the thermometer often ascends to 130°. The maximum of heat noticed by travelers in various places is: Equator 101°, Cape of Good Hope 111°, Bassora 114°, Cairo 104°, Madras 104°, Pendicherry 112°, Paris 101°, Guadaloupe 101°, Surinam 90°, Martinique 95°, Vera Cruz 96°, Vienna 96°, Warsaw 93°, Copenhagen 92°, Petersburgh 87°, Iceland 69°. In New York city the thermometer has a range of about 100°, rarely, however, rising to 100°, and seldom sinking below 0. The changes of temperature in this climate frequently amount to 40° or 50° in twenty-four hours.

Generation of Animal Heat.—The more energetically the organic functions are performed, the more rapid is the generation of animal heat; hence the animals of cold climates, whose actions are vigorous, manifest a higher bodily temperature than those of hot climates, whose motions are more sluggish. The quadrupeds of the frigid zone are said to have a higher temperature than those of any other region of the globe; an arctic fox, killed in an atmosphere of 14°, was found by Capt. Lyon to have a temperature of 106¾.

Capacity to Endure External Heat.—The human body is capable of enduring for a considerable time a highly-heated atmosphere, when the air is dry. Mechanics whose occupations require it, often endure, without perceptible inconvenience, an elevation of 250° to 280°. Some workmen have entered the furnaces of iron-foundries while the floor was red-hot, and the thermometer stood at 350°. Chabert, the "Fire-king," was in the habit of entering an oven heated from 400° to 600°.

Artificial Heat.—As the human body is a self-regulating machine, within certain limits, as respects its temperature, it follows that all artificial means of supplying heat to the body can only be regarded as necessary evils. Fire relaxes and debilitates the skin and the whole system; yet in cold climates and seasons we have no better way of maintaining the requisite temperature of our rooms. These should always be warmed equally throughout every part, and the temperature kept as low as possible, consistently with comfort. The comfortable point of out-door air depends very much on the temperature we have previously been accustomed to; it also varies in different climates and seasons. In this country it ranges from 65° to 75°; but when the thermometer has been for some days between 90° and 100°, a depres-

sion of fifteen or twenty degrees imparts an uncomfortable sensation of cold; and in spring a sudden elevation from 30° or 40° to 75° imparts an oppressive sensation of heat. A room permanently heated above 55° to 60° can hardly be consistent with health, and a few degrees less is still better for most persons. Those who occupy rooms warmed by grates should never sit directly before the fire. Many persons have a habit of sitting with their faces close to a hot fire, but such habits are not only very weakening to the whole skin, but particularly injurious to the brain and nervous system.

HEALTHFULNESS OF CLIMATE.—It has been proved by ample experiment that the aeration of the blood is more rapid in cool or cold than in warm or hot air, owing to the circumstance that rarefied air contains less oxygen in the same bulk than cold air. But I cannot subscribe to the doctrine generally advanced in medical books that all warm climates, or even hot climates, are *necessarily* unhealthful. It is well known that bilious attacks, diseases of the liver, fluxes (as diarrhea, dysentery, and cholera), and some forms of fevers, are more prevalent in hot climates, especially among those who go from a northern to a southern latitude. But I think a better explanation can be found in another way. It is as well known that persons can endure, with apparent impunity, in a cold, bracing air, riotous living, excessive alimentation, constipating food, and many other erroneous habits, which will inevitably produce disease, and frequently death, in a hot, enervating atmosphere. The travelers who visit pestiferous Africa, the Englishmen who remove to the scorching suns of British India, and the Northerners who go to the sickly South, may find the true explanation of their liability to disease in their own dietetic errors.

Undoubtedly the more mild and uniform climates are most conducive to permanent health and longevity. Examples, however, are not wanting of individuals attaining the age of 165 in Russia, and of 200 in Arabia. Variable climates, like England and the United States, are more favorable to activity of mind and body—a rapid development of all the physiological and mental powers; yet that excess of action must sooner exhaust their vitality. Various parts of the United States have furnished numerous examples of centenarians, but I believe Joice Heath, who reached the age of 162, was the oldest person this country ever produced. Rev. Mr. Harvey delivered a temperance lecture in the Broadway Tabernacle in this city, in 1846, at the age of 114.

COMMON COLDS.—"Catching cold" is usually attributed to a sudden transition from a warm to a cold atmosphere; but I believe more

colds result from the contrary change—from a cold to a highly-heated atmosphere, especially the sudden change from a cold, out-door atmosphere, to the confined air of a hot room. I need not say that the body, when excessively cold, should be warmed very gradually. When very hot, however, the body is better enabled to resist extreme cold, and may be suddenly exposed to it with impunity, provided it has not been warmed by any debilitating process or agency, as hot, confined air, severe and exhausting exercise, etc. Colds are more frequently produced by *unequal temperature* than by extremes of either heat or cold. Thus, when a part of the body usually covered with clothing is exposed to a strong draught of air, when the rest of the body is protected with clothing or bedding, a cold is very easily caught. Again, a person accustomed to wear boots in the winter season, will often "take cold" by wearing shoes a few hours, even though he remain within doors, and his feet feel perfectly comfortable. Young ladies, at balls and parties, often make such changes in their clothing as to expose some parts of the body usually covered, as the neck, or cover some parts usually undressed, as the hands and head, or dress some parts thinly which have been accustomed to thicker clothing, the feet and arms, for example, by which the usual temperature of the body is unbalanced, and severe colds produced.

A very common way in which a severe cold, or a great disturbance of the body which is usually denominated a cold, is produced, is eating a very full evening meal after fasting all day, and then retiring soon after to rest, and sleeping in a warm room, or a room heated by hot air. The temperature of the apartment, aided perhaps by bad ventilation, relaxes the body, so that the stomach cannot relieve itself of its burden, and in the morning the sufferer awakes, if indeed he has slept, feverish, sore, and inflammatory, and with all the manifestations of a hard or confined cold.

It is also to a crowded state of the stomach, as much perhaps as to the relaxing temperature and bad air, that the colds so generally following balls and dancing assemblies are to be attributed. The viands at these parties are all so prepared as to tempt the appetite to excessive indulgence, when the state of exhaustion requires exactly the opposite —fasting, so that the muscular system may have its due supply of nervous energy for the restoration of the motive powers.

Those who are exposed to cold, pure, out-door air, may eat very intemperately, as respects both quality and quantity, and suffer but very little, compared with those who commit the same error in the enervating atmosphere of a crowded assembly, when the body is in a state of exhaustion, the whole muscular system relaxed, and the digestive powers proportionately enfeebled.

MEAN TEMPERATURES.—The following table of mean temperatures has been compiled from meteorological registers:

Places.	Latitude	Mean Temperature of several years.	Mean Temperature of different Seasons.				Mean Temperature of	
			Winter.	Spring	Summer.	Autumn.	Warmest Month.	Coldest Month.
	° ′	° ′	° ′	° ′	° ′	° ′	° ′	° ′
New York	40.40	53.78	29.84	51.26	79.16	54.50	80.78	25.34
Philadelphia	39 56	53.42	32.18	51.44	73.94	56.48	77.00	32.72
Washington, D. C.	38.53	55.56	36.80	53.83	75 90	56.59	79.13	34.66
Cincinnati	39.06	53.78	32.90	54.14	72.86	54.86	74.30	30.20
Charleston, S. C.	32.47	60.18	51.09	66.73	80.89	67.55	82.81	49.43
Natchez, Miss.	31.34	64.76	48.56	65.48	79.16	66.02	79.70	46 94
St. Augustine, Fl.	29.48	72.23	59.29	71.47	82.73	75.15	83 94	56.60
Vera Cruz	19.11	77.72	71.96	77.90	81.50	78 62	81.86	71.06
Havana	23.10	78.08	71.24	78.98	83.30	78 98	83.84	69.98
Barbadoes	13.10	79 03	76.07	79.00	81.00	80.00	91.00	65.0
Cumana	10.27	81.86	80.24	83.66	82.04	80.24	84 38	79.16
Quebec, L. C	46.47	41.74	14.18	38.84	68.00	46.04	73.40	13.81
Eastport, Me.	44.54	42.44	23.44	38.58	60.54	45.43	63.52	20.91
Nain, Labrador	57.08	26.42	0.60	23.90	48 38	33.44	51.80	11.20
Newport, R. I.	41.30	51.02	33.82	46 87	68.70	53.83	71.46	32.14
Geneva	48.12	49.28	34.70	47.66	64.94	50.00	66,56	34.16
Paris	48.50	51.08	38.66	49.28	64.58	51.44	65.30	36.14
Florence	43.46	59.00	44.30	56.00	74.00	60.70		
Rome	41.53	60.40	45.86	57.74	75.20	62.78	77.00	42.26
Madeira	32.37	64.56	59.50	62.20	69 33	67.23		
Algiers	36.48	69.98	61.52	65.66	80·24	72.50	82 76	60.08
London	51.30	50.36						
New Orleans	30.	69.01						
St. Louis, Mo.	38.46	55.86						
Jamaica		80.06						

CHAPTER VI.

OF EXERCISE.

NECESSITY FOR EXERISE.—To secure the full and perfect development of the body, nature has implanted among the mental propensities a special organ of motion. The phrenological organ of "mirthfulness," or "playfulness," seems to be intended to secure this end, by prompting to frequent, free, active, and vigorous exercise. Young animals, especially of the mammiferous class, manifest this disposition very early; and young children must have their frequent "play-spells," or be sick—there is no alternative. I am disposed to believe that it is impossible for a healthy adult to be otherwise than active in body or mind, or both, and that *laziness* is actually a disease, dependent on some abnormal condition of the organism.

It is true that a variety of social circumstances may operate to produce an indolent disposition of mind and inactive habit of body, as extreme poverty, excessive wealth, grinding servitude, tyrannical government, etc.; but all these also produce a primary condition of ill health So of personal habits, dissipation, gluttony, dietetic errors, or unhealthful voluntary habits in other respects; they all conduce to the production of a morbid condition.

Nothing is more discouraging to the future prospects of a young child than a disposition to sit still, be quiet, keep out of mischief, etc. Such children may give the nurse and schoolmaster but little trouble in keeping them "out of the way;" but in after life their parents may find it somewhat troublesome and expensive to provide them attendants and doctors.

Physiology of Exercise.—The function of respiration, by which the blood is vitalized, and the nutrition of the muscular structure, on which depends all the motive power or strength of the system, are intimately connected with the circulation of the blood, and this with active exercise. This principle is well illustrated in the effects of gymnastics and training, by which the muscles of any part of the body are remarkably invigorated by regular, systematic exercises. People of all trades and occupations find those parts of the muscular system which are habitually the most exercised to be the most powerful. Thus farmers have the whole muscular system nearly equally developed; blacksmiths, joiners, carpenters, sailors, etc., have strong arms and chests; travelers, dancers, etc., are disproportionately developed in the muscles of the lower extremities; shoemakers, tailors, etc., have a tolerable development of the arms and chest, but suffer in the lower extremities and abdomen; merchants, clerks, and others who pursue an easy, in-door occupation, have slender muscles generally; and professional men, whose exercise is more intellectual than bodily, exhibit large brains, with slender muscles.

Varieties of Exercise.—For hygienic purposes there are many exercises equally advantageous. All that is necessary is that all parts of the body be actively and frequently exercised, within the bounds of not producing fatigue amounting to exhaustion; that is to say, a degree of fatigue which is not readily recovered from on resting. All exercises, however, to secure their full benefit, should be coupled with an object of either utility or amusement, otherwise the mind is apt to labor adversely to the body. Occupation—some useful business pursuit, which requires and hence secures attention and labor during several

hours of each day—is absolutely essential to the highest sanatory condition of the body, for nothing else will insure so constant, regular, and equally divided exercise for both body and mind.

Amusements and plays could be advantageously alternated to vary the monotony of the exercises; and indeed social and family recreations would constitute prominent features of all physiologically regulated neighborhoods. Among the active exercises which may be beneficially resorted to as pastime, are *walking*, *running*, *leaping*, *dancing*. *Boxing* and *fencing* are physiologically adapted to expand the chest, and, in fact, strengthen the whole muscular system, but they are too closely associated with pugilism, and barbarism, and brutalism to be recommended, especially as many other exercises are equally beneficial. *Wrestling* is a dangerous method of developing the muscular power. *Ten-pins*, *billiards*, etc., are excellent exercises physiologically, but no better than *sawing wood*, *planing boards*, *digging potatoes*, *hoeing corn*, *raking hay*, etc., etc. *Singing*, *declaiming*, *reading aloud*, are admirable methods of cultivating the vocal powers, and increasing the capacity of the respiratory apparatus. *Riding on horseback* is one of the best exercises in cases of weak digestive powers, as is also riding in a carriage without springs over a rough road, or street paved with cobble stones. *Hunting* and *fishing* are highly recommended by some hygienic writers, but the ideas of gormandizing, and the exhibitions of cruelty with which they are associated, are hardly becoming a refined, enlightened, and Christian people. Such amusements are more appropriate to *savage* than to civilized life.

Of the passive kinds of exercise, *riding in easy carriages*, *sailing*, *swinging*, etc., they are rather to be regarded as mere amusements, or as expedients for the invalid. They are highly serviceable, and, indeed, indispensable to such valetudinarians as have not strength to get a sufficiency of the out-door air without them.

Exercises of Children.—Our social organization is very defective in its provisions for the appropriate exercises of infants and young children. The *cradle* is a most unphysiological method of exercising a child to sleep; its primary object was to save the nurse trouble, but a child accustomed to be rocked to sleep will give the nurse more trouble in the end than one accustomed to sleep without such assistance. The motion of the cradle, too, is injurious to the brain and nervous system. The modern "baby-jumper" is a better contrivance, but even this can be advantageously superseded by giving the child "the largest liberty" to exercise in its own way. Plenty of room, a smooth floor, and a plentiful supply of any kind of "playthings" which

are not dangerous—India-rubber balls, baskets, brooms, rattle-boxes, etc.—afford the opportunities which a child will always improve to the best possible advantage. Unfortunately, among the poorer classes of our cities young children are kept in stupid inactivity, simply because they have no room to stir; and this confinement makes them sickly, puny, peevish, and finally indolent.

TIMES FOR EXERCISING.—In regard to the times for exercising, the common instincts of mankind have generally guided them correctly. The most severe and active exertions should never be performed on a full stomach, nor immediately before or after a meal. The best hygienic regulation for a laboring or business man, who takes three meals a day, and is regular in his habits of retiring at night and rising in the morning, is to exercise moderately an hour or so before breakfast, perform the severest labor between breakfast and dinner, and work moderately again between dinner and supper. Much evening work is a violation of "the natural order." Persons of sedentary occupations should choose such exercises as they can habitually and regularly attend to, all of which should be as much out-door as possible. Their most active exercises should take place on first rising in the morning, and at other times of day when the stomach is partially empty. Vigorous evening exercises are also suitable for them.

> "Nature lives by toil;
> Beasts, birds, air, fire, the heavens and rolling worlds,
> All live by action; nothing lies at rest
> But death and ruin."

CHAPTER VII.

OF SLEEP.

GENERAL OBSERVATIONS.—Sleep may be defined—the periodical suspension of all the functions of external relation. The constitutional relation of man to the changes of the seasons and the successions of days and nights, implies the necessity of sleep. All animals sleep, but no animal, save man, sleeps on his back, "with face upturned to heaven." The time of sleep required by different individuals varies greatly, according to temperament, manner of life, dietetic habits, etc. John Wesley, with an active nervous temperament, and a rigidly-plain vegetable diet, could perform mental and bodily labors almost Herculean,

and sleep but four or five of the twenty-four hours; while Daniel Webster, with a more powerful, but less active organization, and the ordinary mixed diet, "has a talent for sleeping" eight or nine hours.

As a general rule, in the animal kingdom, herbivorous animals sleep less than carnivorous; and the universal experience of the human race proves that vegetarians require much less sleep than the human omnivora, or those who subsist on both animal and vegetable foods. This fact must be accounted for on the principle of the greater purity, blandness, and adaptedness of vegetable food, requiring less vital expenditure to appropriate it, and exhausting the organic economy less in disposing of its waste or innutritious particles.

PHENOMENA OF SLEEP.—Profound or quiet sleep is the complete cessation of the functions of the cerebral hemispheres and the sensory ganglia, and is attended with entire unconsciousness. Dreaming implies imperfect rest—some disturbing cause, usually gastric irritation, exciting the brain to feeble and disordered functional action. Individuals of very studious habits, and those whose labors are disproportionately intellectual, require more sleep than those whose duties or pursuits require more manual and less mental exertion. But no avocation or habit affects this question so much as the quality of the ingesta.

NATURAL TERM OF SLEEP.—Physiologists are not well agreed respecting the *natural* duration of sleep. Historical data seem to indicate that a great majority of those who attained great longevity were long sleepers, averaging probably at least eight hours. The statute of nature appears to read: Retire soon after dark, and arise with the first rays of morning light; and this is equally applicable to all climates and all seasons, at least in all parts of the globe proper for human habitations, for in the cold season, when the nights are longer, more sleep is required.

A general rule, and an invariable rule for all whose voluntary habits are correct, and who retire to rest early in the evening, is, to sleep as long as the slumber is quiet, be the time six, seven, eight, or nine hours. Dreamy, restless dozing in the morning is generally much more debilitating than refreshing. Those persons who indulge largely in animal food, or eat gluttonously of any thing, and especially those who are addicted to spirituous liquors and tobacco in connection with high-seasoned animal food, are in danger of over-sleeping, even to the extent of very considerably increasing the stupidity and imbecility of mind, and indolence and debility of body, naturally and necessarily consequent upon those habits.

Sleeping after Meals.—Some persons are partial to the *siesta*, or 'dinner nap," and physicians are divided in opinion whether the habit is useful or injurious. Dr. Dunglison, who appears to be in some doubt on the subject, but rather inclines to regard a short sleep after dinner favorably, remarks: "It is *certain* that after a full meal both man and animals feel a propensity to sleep." I regard it as perfectly certain that there is no such propensity in man, except when his full meal has been an improper one. If he has slept too little the night previous, he may feel a propensity to sleep at any time during the next day, but not more after a meal than at any other time, unless his meal were fuller than the wants of his system demanded, or of too stimulating or concentrated a character to be healthful; nor is the assertion correct as respects the animals, excepting the carnivorous and gormandizing varieties. Sleeping after meals is always pernicious; and for an adult to sleep at all during the day can be regarded no better than the least of two evils when sufficient sleep is not had at night. All persons who can should do all their sleeping at once, and not eat such quantities or qualities of food as will produce the *unnatural* propensity to sleep after meals.

Sleep for Different Persons.—It has long been a popular *whim* that females require more sleep than males, and many physiological reasons, as whimsical as the whim itself, have been offered in support of the notion. I know of no sound argument that proves any difference so far as sex is concerned; and I think a safe rule for male and female, young and old, is, for children to sleep all they are inclined to, without the aid of extra-nervine agencies, rocking in the cradle, or paregoric drops; and for the middle-aged and old, of both sexes, to sleep all they can at one effort, between sunset and sunrise. Of course those whose business or pleasure obliges them to retire at late or irregular hours should govern themselves accordingly.

Bodily Position during Sleep.—The *position* of the body in bed is worth a moment's reflection. It should be perfectly flat or horizontal, with the head a little raised; one common-sized hair pillow is generally sufficient. A majority of people sleep with the head too high, often elevated on two thick pillows, with a heavy bolster for the shoulders This is certainly a very bad habit. The neck is bent, the chest is compressed, and the whole body unnaturally crooked. Children often become stoop-shouldered, or otherwise crooked, from their heads being placed on high pillows. Some physiologists object to sleeping on the back, and assign as a reason that the stomach and other

abdominal viscera press upon the large blood-vessels below the heart, and thereby produce a tendency to cerebral disturbances, nightmare, apoplexy, etc. This argument only has weight with those who take late or heavy suppers, or suffer from enlarged livers or other abnormal conditions. Healthy persons, of correct dietetic habits, may sleep at pleasure on the back, or gently reclining to one side. All, however, should carefully avoid reclining nearly on the face, or crossing the arms over the chest, as that would approximate the shoulders, contract the chest, and materially affect the respiration. Sir Charles Bell thinks the incontinence of urine, which so frequently troubles children, arises from their lying on their backs. A more rational explanation of this difficulty may be found in the *paregorics*, *antimonial wines*, *herb teas*, and other weakening drugs and debilitating slops with which they are so generally stuffed by kind mothers, as per advice of sage doctors.

Beds and Bedding.—The nature of the *beds* and *bed-clothing* are of importance to those who would preserve or attain health. Feathers can only be mentioned in reprobation. Straw, corn husks, hair, and various palms and grasses, make comfortable and healthful beds. In cold weather those who are tender may use over either of them a light, thin, cotton mattress. No bed should be soft enough for the body to sink into it; and few persons who have thoroughly tried the experiment of sleeping on feathers and on straw will willingly exchange the latter for the former. Children and infants are cruelly though unwittingly abused, when compelled to sleep on feathers. I can hardly imagine that any person would be willing to have a pillow of feathers under his head, after once getting accustomed to one of hair, chaff, or even straw. Cotton is much better for pillows than feathers. The bed-clothes should be as light as possible consistently with comfort. Linen or cotton sheets are better than flannel, and for outside bedding thin quilts are best in summer, and light flannel blankets in addition in winter.

Sleeping apartments always ought to be large and well ventilated; but generally they are neither. Especial attention is therefore, as intimated in a preceding chapter, due to these circumstances. The windows or doors should be so arranged as to allow a free circulation of air; even *night* air, which many people and some medical writers appear to think is really poisonous, should have free ingress. If the sleeping-room is dark or damp, it should be occasionally dried and aired, by a fire if necessary, which may be put out before the sleeping hour. Whether fires in sleeping-rooms are to be advised or discountenanced, medical men agree as little among themselves as they

do in relation to almost every other hygienic influence that can be named. While their expediency for some invalids is unquestioned, but little reflection seems necessary to convince any mind unprepossessed with vague theories that, as a habit, they cannot be otherwise than pernicious. When fires are employed during the daytime in the sleeping-room, they should be extinguished and the room well aired before going to bed. In houses heated with warm air, particular attention should be paid to ventilating the lodging-room.

CHAPTER VIII.

OF CLOTHING.

PHYSIOLOGICAL NATURE OF CLOTHING.—It is an obvious physiological fact, that the more the whole surface of the body is exposed to the external air, within certain limits, the more vigorous is its functional action performed, and the better is it enabled to preserve its own proper temperature, as well as to resist all morbific impressions from vicissitudes of weather, or the extremes of heat and cold. Clothing, therefore, which the usages of society and the severity of climates render indispensable, should, as an invariable rule, be as light and loose as possible without bodily discomfort. We must, however, recollect that comfort is very much a matter of habit, and make a due discrimination between the natural sensation of health and the morbid sensitiveness produced by false customs. Some persons wrap their whole bodies in flannel under-garments, and yet are ready to go into a "shivering fit" at every unusual breath of cold air: while others eschew those garments entirely, and endure the coldest weather of this climate with much less discomfort.

MATERIALS OF CLOTHING.—The substances principally employed in the manufacture of clothing in civilized countries are, *linen*, *cotton*, *silk*, *wool*, and *hair* or *down*. Those materials which are bad conductors of caloric, afford the greatest *immediate* protection from cold, as woolens or flannels; but, for the same reason, they are more debilitating to the cutaneous function; they are only to be preferred in cases of temporary exposure, or in very cold climates, or as a "necessary evil" in persons whose external surface is debilitated by bad habits of dress, until its vigor can be restored by bathing and other hygienic

processes. Cotton and linen are better adapted to temperate climates, especially during the warm season; and linen for under-clothes is the best of the two in hot weather. Flannel next the skin, I am persuaded, is invariably hurtful as a habit. When woolen clothing is worn, it should be the outside garments; these may be of any quantity or thickness necessary to keep the body comfortable, while cotton or linen only comes in contact with the skin. The discrepancies among medical authors on this subject are almost ludicrous; some advocating the use of flannel next the skin, at all times and in all seasons; others condemning it as a fruitful source of colds, coughs, pulmonic and rheumatic affections, etc. "As regards the chest," says Sir George Lefevre, "a very light kind of woolen waistcoat should not be dispensed with even in the dog-days." I would much rather prohibit it in winter than prescribe it in summer. In the last cholera season (1849) the New York Board of Health, by authority of their Medical Council, recommended, as among the preventive measures, "the wearing of flannel next the skin," during the hot weather of June, July, and August. And on this hint a medical adventurer has since invented medicated aprons and bandages to keep the bowels *warm*, or, as the proprietor says, "retain the animal heat," and thus prevent bowe complaints. These notions are too absurd for serious refutation. Silk is a bad conductor, and for this reason females find silk dresses very uncomfortable in very warm weather. Furs are worn in this country more for ornament than use. They are the warmest clothing materials known, and by overheating the part of the body to which they are applied, render it extremely susceptible to cold. Fur neckcloths, caps, etc., are very pernicious.

Color of Clothing.—In a strictly hygienic regulation of dress, color cannot be wholly disregarded. White colors reflect the rays of caloric; black absorbs them. Light-colored clothing is therefore more comfortable and sanatory in warm weather than dark-colored, because the former repels the heat, and the latter readily receives and retains it. Various experiments have shown that the heat-reflecting or heat-retaining property of different fabrics varies exactly with their lighter or darker shades of color. This difference is, however, much greater in the luminous rays of light than in the non-luminous. When, therefore, we are not exposed to the sun, the subject of color is of less importance. The absorbing power of dark surfaces renders the skins of dark-colored animals, as well as of the darker persons or races of the human family, less liable to be scorched or blistered by the direct rays of the sun, than are those of a lighter color.

Particular Garments.—Fashion seldom consults hygiene in the matter of dress. The hat is generally too stiff, heavy, and hot. It ought to be as light and soft as possible, and as thoroughly ventilated as a bed-chamber. This could easily be accomplished without marring its beauty. The common neck-stock or cravat is one of the worst articles known; by confining and heating the throat it predisposes to colds, rheumatism, quinsy, bronchitis, etc. I have known several persons in New York city, who were habitually the subjects of two or three severe attacks of quinsy a year, entirely cured by continually exposing the neck in all weathers, and bathing it daily in cold water. That the natural clothing of an unshaven beard is a protection against affections of the throat and lungs, I have no doubt. But if we will render ourselves preternaturally susceptible by shaving, we should not aggravate the susceptibility by binding up the neck with tight clothing. Females are generally debilitated by too heavy an amount of clothing about the back and hips. The custom with some females of oiling the hair, then combing it very smooth, and fastening it in a bunch on the top of the head, is very injurious to the scalp and brain; in fact, a common source of headache and nervousness. Stockings of cotton and linen are better than flannel, except when the feet are exposed to both extreme cold and moisture. Garters are a common cause of *varicose veins* in the lower extremities. Fur gloves are a bad article; so are India-rubber shoes, except as over-shoes to slip on temporarily. Straps for fastening the pantaloons tightly to the boot or shoe, I believe are almost or quite out of fashion; it is well they are so, for they render all the motions of the body stiff and awkward, and cause an injurious pressure to be exerted on the knee-pan and shoulders. Several cases of *synovitis*, attended with extreme weakness of the muscles around the knee-joint, have lately come under my notice, produced, without any doubt, by wearing pantaloon straps. Suspenders, when the trowsers are loose and easy, are not objectionable; although the sailor, whose vocation requires the utmost freedom from all restraint in the muscles of the chest and upper extremities, finds it more convenient to support the trowsers by the tightened waistband.

Custom has dealt more cruelly with infants than with adults in the style of clothing. Swathing, bandaging from head to foot with the view of getting the body in shape, and bandaging the abdomen to prevent the child from becoming "pot-bellied," are fashions happily fast going into disrepute, under the teachings of hydropathic and physiological writers. The new-born infant wants no bracing or supporting from the clothes. All the clothing required in infancy and childhood is easy, loose, flowing garments, sufficient to preserve the requisite temperature

Bed and Body Linen.—It is always of importance that the bed and body linen be well aired daily, and frequently changed. Strict attention to the depurating function of the skin requires that the undergarment or shirt worn during the day should never be slept in during the night. The sheets, too, which collect more or less of the matters of perspiration, should be well exposed to the air every day. How often the shirts worn in the daytime require changing, depends something on the amount of exercise, perspiration, etc.; generally two or three times a week are advisable.

General Rules.—The first physiological rule of dress is, to have all garments as light in texture and as loose in fashion as is consistent with bodily comfort, and as will admit of the most perfect freedom in the exercise of every muscle of the body. The second is, to observe regularity and uniformity. Boots, shoes, hats, caps, thin and thick stockings, gloves, mittens, neck-dresses, head-dresses, etc., when worn at all, should be always worn under similar circumstances—not indiscriminately changed or alternated. As intimated in a preceding chapter, inequality of clothing is a far more frequent cause of "colds" than deficient clothing. If a person exposes a part of the body usually protected by clothing to a strong current of cold air, he will take cold sooner than by an equal exposure of the whole body.

CHAPTER IX.

OF BATHING.

Reasons for Bathing.—Were human beings in all other respects to adapt themselves to the laws of their organization, and were they in all their voluntary habits in relation to eating, drinking, clothing, exercise, and temperature, to conform strictly to the laws of hygiene, I do not know that there would be any physiological necessity or utility in bathing at all. But in civic society the laws of life and health are transgressed in a thousand ways; and the sum total of all the unphysiological habits of civilized life is, a condition of body characterized by deficient external circulation, capillary obstruction, and internal congestion or engorgement. To counteract this morbid condition no single agent or process is more effectual than bathing the whole surface of

the body daily with cool or cold water. As a general rule, therefore, a daily bath should be as regularly attended to as are the daily meals.

Methods of Bathing.—For hygienic purposes there are various methods of bathing equally advantageous; the particular process is merely a matter of convenience. The towel or sponge bath, plunge, or shower, are, in ordinary cases, equally useful. The first-named is accessible to all persons, at all times, where a coarse towel and a quart of water exist. The others require less time and are more agreeable to persons accustomed to bathing. A portable apparatus for travelers has lately been constructed, which may be conveniently packed in a trunk or carpet-bag, and used in the bedroom of the hotel, or state-room of a steamboat. After the ablution, in whatever manner performed, the whole body should be thoroughly rubbed with a crash towel

Time and Temperature of Baths.—The best time for a general bath is unquestionably on first rising from bed in the morning. Bathing at any time of day, when the stomach is partially or completely empty, is better than no bath. In warm weather an additional evening ablution is refreshing and invigorating. The temperature of the water must be varied to suit different circumstances of constitutional health and vigor. The general rule is, that cool or cold water, short of producing any permanently disagreeable chill, is the best. Of course, persons of deficient blood and low vitality should use tepid water; and extremely feeble individuals should commence with warm water, gradually reducing the temperature as "reaction" improves. The *cold* bath may, for general purposes, include all temperatures below 60° Fahr.; the *cool*, from 60° to 72°; the *tepid*, from 72° to 85°; the *warm*, from 85° to 100°; and the *hot*, above 100°.

Infants ought to be bathed daily from birth. The water should be at the temperature of about 72° for the first three months, and reduced about five degrees every three months for a year, after which time, if the child has been well managed in other respects, it may be bathed in water of any medium temperature—say between 50° and 65°.

Precautions in Bathing.—No person should bathe in very cold water when the body is chilly from cold, nor when exhausted or over-fatigued from violent exercise, nor when, from any cause, the respiration is materially disturbed, nor soon after eating. Heat and perspiration are no objections to going into cold air or cold water, provided the body is not in a state of relaxation from confined or bad air, or debility from over-exertion, and the breathing is easy and natural.

CHAPTER X.

OF THE EXCRETIONS

Relation of Excretion to Nutrition.—From the physiology of the nutritive and the depurative functions we learn that an exact equilibrium must exist between the deposition of new material and the removal of old, in order to sustain the vital machinery in its perfect integrity of health and strength. If the nutritive functions be deficient, debility and inanition result; if the excretory functions are imperfectly performed, obstruction, congestion, inflammation, and fever prevail.

The Involuntary Evacuations.—As already explained, the *lungs*, *liver*, and *skin* are constantly eliminating from the body the greater portion of its waste, worn-out, useless, effete, and putrescent particles, their office being quite independent of the action of the will and voluntary muscles. If the food and drink is rightly apportioned in quantity and quality, and all other hygienic circumstances are duly regarded, their functional office will only cease when the body consolidates to a state of motionless density in a natural death. But when the voluntary habits are unhealthful, or when, from any morbific agencies, the involuntary excretions are checked or suppressed, we see a variety of phenomena indicative of disease. If the lungs fail in functional power, the whole surface is leaden and bloodless, the eye is dull, the face is wan and blue, the complexion is inanimate, and the extremities are cold. If the liver does not duly eliminate the bile, the blood is thick and viscid, the skin is dingy and cadaverous, the head is oppressed, the mind is confused, the nerves are weak and irritable, and the eyes yellowish or livid. If the skin fails to throw off the matters of perspiration, the lungs are oppressed, the head is giddy and painful, the mouth is parched and feverish, the heart is troubled with palpitation, the kidneys are irritated by excess of duty, and the bowels are liable to gripings, spasms, exhausting diarrheas, or inflammatory attacks.

The Voluntary Evacuations.—The *bowels* and *kidneys* cleanse the body of the grosser fecal matters, and most of the surplus or extraneous saline and earthy particles. If the bowels are torpid, the indi-

vidual is troubled with fetid breath, bad taste in the mouth, coated tongue, gnawing or other uneasy sensations at the stomach, dry and harsh or cold and clammy skin, colic, sick headache, acrid eructations, bilious attacks, and generally hemorrhoids or piles. If the urinary secretion is deficient, dropsical accumulations take place, the head is exceedingly heavy, oppressed, and even apoplectic, the whole nervous system is excessively irritable, the cutaneous exhalation is impregnated with a urinous odor, and a low, irritative, and exhausting fever evinces the general putrescent condition of the whole body. The importance of attending to the solicitations of nature, so far as these evacuations are controlled by volition, cannot be overrated. Many persons have been seriously injured by retaining the urinary secretion for some time after its sensible accumulation. Few persons who live in the ordinary manner appear to have any intelligible idea of what constitutes a healthful and natural action of the bowels. Many imagine that *periodical regularity* is all that is desired. But they may have a movement of the bowels regularly every day, and uniformly at a particular time of day, *and still be very constipated*. The alimentary canal may still have retained fæces from one month to another. Healthful peristaltic action of the bowels demands not only that the dejections occur daily, regularly, and uniformly, but that each discharge be free, easy, and copious, but not watery, and without pain, straining, or irritation. I have seen many persons who assured me, on a professional examination, that their evacuations from the bowels were always "perfectly regular," when the furred tongue, foul breath, and turgid abdomen, assured me that this depurating function was very imperfectly performed.

Hardly a disease can be named but may have its origin in constipated bowels, and almost every habit of the present artificial state of society conduces directly to this result. The long catalogue of diseases peculiar to females, a large proportion of the fatal maladies of children, and a vast majority of the cases of dyspepsia and hemorrhoids, so common among adults of both sexes, have one of their principal causes in this condition. I need hardly add that no one can permanently enjoy good health, whose voluntary habits, in relation to diet and exercise, do not secure the integrity of this functional duty. It is a sad commentary on the boasted healing art of allopathic practice, that its professors doctor, physic, force, and purge the torpid bowels of their patients, year after year, and leave them invariably worse in the end, while they permit each and all of the causes which produce torpid bowels to operate continually, uncontrolled, unattended to, and almost unthought of.

CHAPTER XI.

OF THE PASSIONS.

MENTAL HYGIENE.—We may religiously observe all the laws of hygiene in relation to air, light, drink, food, temperature, exercise sleep, clothing, bathing, and the excretions, and yet "lack one thing." If the passions are our masters, and not our slaves, they will rule and ruin, instead of obeying and serving us. There is no single hygienic influence more conducive to health, happiness, and long life, than a cheerful, equable temper of mind; and there is nothing that will more surely disorder the bodily functions, exhaust the vital energies, and stamp premature infirmities on the constitution, and hurry us on to an early grave, than an uneven, irritable, fretful, or passionate mental habit.

DIFFERENT PASSIONS AS AFFECTING HEALTH.—There is, in the vigorous exercise of the higher mental powers—the moral affections and the intellectual faculties—an elevating, sustaining, self-supporting influence; while the violent indulgence of the lower order of passions—the animal propensities—rapidly wears out the mental machinery, and enervates all the physiological powers. Who that has ever felt the holy inspiration of *love*, and the depressing influence of *hatred*, can fail to appreciate the importance of mental hygiene? Contrast the emotion of *benevolence*, or *gratitude*, or *veneration*, or *conscientiousness*, or *mirthfulness*, or *faith*, or *hope*, with that of *envy*, *revenge*, *jealousy*, *fear*, *grief*, *remorse*, or *despair!* One energizes the mind and reanimates the body—the other sinks, chills, and enfeebles both; one manufactures, creates, as it were, vital power—the other wastes and destroys it.

HEALTHFUL EXERCISE OF THE PASSIONS.—It is true that all the propensities with which we are endowed were intended to be exercised actively and vigorously, but always in relation to the uses or purposes for which they were given—never with violence, or in mere wantonness. When they are all exercised harmoniously with each other, their combined influence is to invigorate, ennoble, and exalt the whole being; but if one or several "grow mutinous and rave," the whole physiological and psychological nature experiences a deteriora-

tion proportioned to the time and degree in which ungoverned passion is in the ascendant.

Those who would maintain permanent and uniform health and attain longevity, should cultivate the "better passions" with the same sedulous and unremitting care that they would cultivate the best fruits and vegetables. That anger which "dwells only in the bosom of fools," should be a rare or unknown visitant, and the "evils of life" should be met with courage, fortitude, and resolution, instead of wailing, complaining, and lamentation. That unhappy disposition which treats all the little or great perplexities, crosses, trials, disappointments, or troubles, which are incidental to existence, and which more or less beset the earthly pilgrimage of every individual, with fretting, scolding, and fault-finding, not only aggravates all the "necessary evils" of life, but greatly multiplies them; and, what is worse, dissipates foolishly those talents and energies which should be devoted to overcoming obstacles, and, by profiting from the lessons of experience, "bringing good out of evil."

The Passions as Connected with Longevity.—In all ages of the world philosophers, divines, naturalists, statesmen, and other men whose studies and avocations were especially calculated to develop and maintain the supremacy of the moral and intellectual powers, have been proverbially long-lived. In this connection we may name among the ancients, Homer, Hippocrates, Pythagoras, Plutarch, Plato, Thales, Xenophon, Carneades, Sophocles, Zeno, Galen, Democritus; and among the moderns, Locke, Newton, Galileo, Boyle, Liebnitz, Buffon, Olbers, Blumenbach, Hahnemann, Swedenborg, Sir Edward Coke Fontanelle; and in our own country, Marshall, Jefferson, Franklin, Adams, Jay, and Madison. All of the persons above quoted were distinguished for active and laborious habits, and some of them were intense if not intemperate workers. The experience of a host of men renowned for great attainments in morals, theology, and various departments of science, proves that an immense amount of mental labor can be accomplished by an individual of ordinary natural capacity, when the propensities are harmoniously balanced, and an even, cheerful, hopeful spirit constantly cherished and maintained.

The Passions as Affecting the Secretions.—It is well known to medical men that violent fits of passion will arrest, alter, or modify the various organic secretions as suddenly as will an electric shock. They may be depraved or vitiated as readily by excessive mental emotion as by a drug-poison taken into the stomach. A paroxysm of anger

will render the bile as acrid and irritating as a full dose of calomel; excessive fear will relax the bowels equal to a strong infusion of tobacco; intense grief will arrest the secretion of gastric juice as effectually as belladona; and violent rage will make the saliva as poisonous as will a mercurial salivation. Many a nursing mother has sent her babe to the grave by indulging a furious emotion, which changed the character of her milk from a bland nutriment to a deadly poison. These facts, which could be multiplied to a great extent, demonstrate the law, that a sound body cannot exist unless connected with a well-balanced mind.

Physiological Law of the Passions.—The grand essential of a cheerful mind is self-control. This is the great law of mental hygiene. Those who cannot govern the lower range of propensities—the corporeal and social groups—by the moral sentiments and intellectual faculties, should study to acquire self-government as "the one thing needful" in the mental operations. It may require long, patient, and thorough discipline; it may cost much self-denial, and appear to demand great temporary sacrifices, but it is worth all it costs. Occasionally it is acquired through long years of bitter experience; and sometimes the greater part of a life is spent in suffering, disappointments, troubles, and crosses, ere the mind is found at peace with itself, and in right relations to all surrounding nature. Happy are they who can, even in such expensive schools, learn the art of adapting themselves to the invariable laws of the universe, which they cannot successfully oppose, or in any respect alter! Without self-control, let it be well understood, no one is competent to govern others. To *mothers* this principle appeals with more momentous interest than to any or all other persons; for it is their influence and example which infuse order or disorder into the infant mind, to "grow with its growth, and strengthen with its strength."

CHAPTER XII.

OF LONGEVITY.

Natural Duration of Life.—The Scriptures inform us that at one particular age of the world and state of society, "three score and ten" years were allotted to man; that at a preceding period, sur-

rounded by different circumstances, it was ordained that "his days should be an hundred and twenty years;" and that soon after the creation, when the air was free from infection, the soil exempt from pollution, the food of man plain, simple, and natural, and the ways of debauchery and dissipation almost unknown, individuals lived on the average four or five hundred years, the maximum point of longevity recorded being nine hundred and sixty-nine years.

Without speculating upon the problem, whether the years of the early historians included the same period of time as the years of our present almanacs, it is sufficient for all practical purposes to know the general law, that human lives may be lengthened to one or two hundred years or more, or "dwindled to the shortest span," by our own voluntary individual and social habits. I can discover no physiological or natural law why man should not live some centuries, when placed under every possible favorable condition of constitution, climate, food, occupation, etc. It is obvious that, at the present day, a large proportion of our population is born with organizations incapable of manifesting the phenomena of life for a longer period than sixty or seventy years; many, indeed, have not original vitality sufficient to reach the age of manhood, and others are born too feeble to survive the days of childhood; but, on the other hand, all ages of the world, and nearly all countries, give us many examples of individuals, even under many unfavorable influences, reaching various periods of life over a hundred years; some of them nearly completing the second century, and some few, if we may credit the records, enduring into the third century. If it can be proved that *one* man may live two or three hundred years under the most favorable hygienic circumstances, we want no further evidence of the existence of a physiological law that *all* may, under precisely similar circumstances. The learned Lichtenberg, who collected many statistics on the subject of longevity, declared, "*Facts* answer that man, in general, can live from one hundred and fifty to one hundred and seventy, and even two hundred years."

Examples of Longevity.—Haller collected most of the cases of longevity known in Europe in his time. Among them were over a thousand who attained to ages between 100 and 110 years; sixty from 110 to 120; twenty-nine from 120 to 130; fifteen from 130 to 140; six from 140 to 150; one reached 169 years. The Russian statistics of 1830 give examples of two hundred and fifty-five individuals between the ages of 100 and 160. In England and Wales, during a period of eighteen years preceding 1830, over seven hundred persons were buried each of whose ages exceeded 100 years. Baker's "Curse of

Britain" gives a list of about one hundred individuals whose ages ranged from 95 to 370! Twenty-one of them reached the age of 150 and upward, and about thirty exceeded 120 years. Pliny copied from the records of the census in the time of Vespasian, the cases of one hundred and twenty-four men, living between the Po and the Apennines, who had attained ages from 100 to 140 years. At the same time there were living in Parma five men of ages from 120 to 130; in Placentia one of 130; at Facentia a woman of 132; and in Vellàgacian ten persons, six of whom were 110 and four 120 years of age. Herodotus informs us that the average life of the Macrobians was 120 years. The Circassians, according to the traveler, Mr. Spencer, attain a very advanced age. Modern statistics exhibit numerous examples of persons, in various parts of the United States, in Norway, Sweden, Denmark, Scotland, Ireland, Poland, Greece, and among the vegetarian Bramins of India, attaining more than one hundred years of age. France, Spain, and Germany afford a few examples. Many places on Long Island, in the state of New York, will compare advantageously with almost any equal number of places on the globe, as regards the longevity of their inhabitants, and the number who have attained 100 years of age. The American Indians, previous to the introduction of the white man's "fire-water," frequently lived to the age of 100 years. The following catalogue of names and ages of persons distinguished for length of years has been collected by Baker, Horsell, and others. There is a discrepancy of a few years in relation to four or five of the individuals between the ages here stated and those given by other authors. The difference, however, is not material, and can in no way affect our argument or inferences. William Dupe 95, William Dupe's father 102, his grandfather 108, Michell Vivian 100, John Crossley 100, Lewis Cornaro 100, Admiral H. Rolvenden 100, Jane Milner 102, Eleanor Aymer 103, Eleanor Pritchard 103, her sisters 104 and 108, William Pepman 103, William Marmon 103, wife of Cicero 103, Stender 103, Susan Edmonds 104, St. John the Silent 104, James the Hermit 104, Hippocrates 104, Bar Decapellias 104, Mrs. Hudson 105, Helen Gray 105, Mrs. Alexander 105, St. Theodosius 105, Mazarella 105, John Pinklam 105, St. Anthony 105, Mary Nally 106, Thomas Davies 106, his wife 105, Ann Parker 108, Gorgies 108, Simon Stylites 109, Coobah Lord 109, Democrates 109, De Longueville 110, Ant. Senish 111, Ann Wall 111, Luceja 112, Mittelstedt 112, J. Walker 112, W. Kauper 112, W. Cowman 112, E. M. Gross 112, Paul the Hermit 113, F. Lupatsoli 113, M. Mahon 114, John Weeks 114, R. Glen 114, St. Epiphamus 115, George Wharton 115, Louis Wholeham 118, Bamberg 120. Arsenius 120.

Romualdus 120, John Bailes 122, Margaret Darley 130, Francis Peal 130, William Ellis 130, Bamberger 130. Peter Gorden 132, John Garden 132, Richard Lloyd 132, John Taylor 133, Catharine Lopez 134, Margaret Forster 136, John Mount 136, Margaret Patten 137, Juan Marroygota 138, Rebecca Perry 140, Galen 140, Dumitor Radaloy 140, Laurence 140, Countess of Desmond 140, Mr. Ecleston 143, Solomel Nibel 143, William Evans 145, Joseph Bam 146, Colonel Thomas Winsloe 146, Llywark Ken 150, Judith Crawford 150, Catharine Hyatt 150, Thomas Garrick 151, Francis Consist 152, James Bowels 152, Thomas Parr 152, Thomas Damma 154, Epimenides 157, Robert Lynch 160, Letitia Cox 160, Joice Heth 162, Sarah Rovin 164, William Edwards 168, Henry Jenkins 169, John Rovin 172, Peter Porton 185, Mongate 185, Petratsch Czarten 185, Thomas Cam 207, Numes de Cugna 370.

Zeno, the founder of the stoical sect, lived 100 years; Titian, the painter, nearly 100; Francis Secardia Hongo died A.D. 1702, aged 114; in 1757, J. Effingham died at Cornwall, aged 144; Alexander Macintosh, of Marseilles, lived 112 years; James le Measurer, of Navarre, 118 years; Valentine Cateby, of Preston, England, 118 years; Henry Grosvenor, of Wexford, Ireland, 115 years; John de la Somet, of Virginia, 130 years; Elizabeth Macpherson, of Caithness, Scotland, 117 years; Owen Carollan, of Ireland, 127 years; Ann Day, an English gipsy, 108 years; Cardinal de Salis, of Seville, 110 years

NATURAL DEATH.—Diseases which produce violent or accidental death, destroy the whole human race, with few exceptions. Probably not one in a thousand dies a natural death. Even of those whose names have been held forth in the preceding paragraph as examples of extraordinary longevity, several were cut off prematurely by disease. Thomas Parr, at the age of 152, was destroyed by plethora, resulting from high living at court. Mrs. Hudson died of an acute disease resulting from taking cold at the age of 105. Richard Lloyd was in full health and strength at 132 years of age; but being persuaded to eat flesh-meat and drink malt liquors, to which he had not been accustomed, he soon sickened and died.

Natural death results from a gradual consolidation of the structures. In infancy, the proportion of the fluids of the body to the solids is much greater than in adult age, but this relation is constantly changing; the fluidity, flexibility, and elasticity of youth, as the structures harden and condense, is succeeded by the firmness, stiffness, and immobility of age; yet this change is not necessarily attended with infirmity or decrepitude. If the life has been very nearly in conformity with

the laws of life, the vital energies, so powerfully expended upon the muscular system during the period of growth and development, are, after the maturity of the body, mainly concentrated in the region of intellect. There is less activity, and vivacity, and impulse, but more serenity, and thoughtfulness, and meditation. The moral and intellectual nature seems not to reach its full development until actual decline has commenced in the functions of organic life. We are accustomed to notice, as the earliest marks of senility, the decay of the teeth, and the disproportionate destruction of the functions of the external senses, especially seeing and hearing. But such is not the natural decline of life. In a perfectly normal condition of the organism, all the functions, powers, and senses decline in the same harmonious relation in which they were developed. As the process of condensation goes on equally and imperceptibly throughout the organic domain, the motive powers grow torpid, the nutritive functions are enfeebled, the sensibility becomes dull, the external senses are obtunded, and, lastly, the mental manifestations disappear—death occurs without a struggle or a groan.

Advantages of Longevity.—Some speculative writers, whose minds have been more directed to the narrow science of "political economy" than to an enlarged view of the economy of the universe, have lately found a perplexing problem in the relation of the means of subsistence to the facilities for propagation. While population, say they, increases geometrically, the alimentary productions of the earth only increase arithmetically. On this bare proposition longevity seems to be one of the greatest evils that can befall the human family. Some scheme of death appears to be indispensable, to "kill off" the surplus population, to clear the ground of *existing* human beings as fast as the "coming generations" demand their places. But such a theory places us in an awkward dilemma, and is not very well calculated to "vindicate the ways of God to man," nor give us the most exalted views of what constitutes "man's *humanity* to man." But the whole puzzle comes from mistaking the present social disorder for natural order. It is very true that in some parts of the world there is a dense population in a state of starvation; but it is equally true that the earth has capacity even there, to produce food enough for all, and to spare. Under existing governments and social arrangements, more than three fourths of all the land and all the labor, as far as the production of the means of human sustenance is concerned, is wasted, or worse than wasted. A large extent of the earth's surface has never yet been brought under cultivation, and that part of it which is cultivated the best admits of vast improvement. There is also an immense waste in raising domestic

animals for food, for it requires not less than twenty times more extent of soil to nourish animals enough to furnish our food, than is necessary to supply us with food directly from the soil itself. And again, millions of acres of excellent land are worse than wasted in raising the filthy tobacco and fruits and grains to convert into alcoholic poisons.

But there is a much more cogent argument derived from the physiological principles we have been considering, against the position that "creation is a failure;" for the idea I am controverting amounts to nothing less. It is a philosophical maxim that "intensive life cannot be extensive." The present races of human beings have a hurried, stimulated, forced, disorderly existence. Population is as much more numerous, as a general rule, as it is more depraved; the causes of multiplying the species increase with the causes of their destruction. Males and females marry at twenty, become the fathers and mothers of a "numerous offspring" at forty, find themselves old at fifty, and are compelled to die at sixty; in this way, supposing the majority of the children to arrive at maturity, and "do likewise," the world will surely fill up pretty fast, and there will be a perpetual demand for "new countries," for the surplus population, or for those other less pleasant resources, "war, pestilence, and famine." But philosophers ought always to discriminate between the existing state of affairs, and a state of affairs that may, can, or should exist.

There are many forcible reasons for believing that the earth now has, and always will have, room enough for all the population that can be produced by human beings who live according to the laws of their being, and till the ground according to the best lights of science and experience. If the human body develops slowly and healthfully, the periods of infancy, childhood, and adolescence will be greatly prolonged; the period of youth may extend to what we now call old age, while vigorous manhood may reach onward to some point between one and two hundred years, or even beyond; and under such circumstances it is probable that the number of offspring in each family would be less instead of greater than the average of the present day; at least such was the fact with the early inhabitants of the earth with whose histories we are familiar.

Again, we have many evidences that the surface of the earth actually enlarges continually. The proportion of the land is gradually gaining upon the water. Not only are the lakes, and seas, and oceans filling up, and the wild, frozen wastes of the polar regions destined to become, in due process of time, luxuriant harvest fields and flowery gardens, but it is even probable that the entire magnitude or bulk of the earth enlarges by constant accessions of matter, absorbed and condensed from

the gaseous elements floating in what we call space. If these views are correct, and they are certainly not wholly speculative, they afford a complete solution of the problem of population and subsistence, and furnish politicians with a key to a system of legislation that shall not be limited to acts, enactments, and amendments of acts, almost exclusively relating to the "rights of property," but which shall, in its higher, broader, nobler grasp, comprehend also the PROGRESS OF HUMANITY.

But the chief use and purpose of a long life are yet to be named. As society is now constituted, the principal force of the mental energies of the world is expended in contriving a thousand ways and providing a thousand means to gratify the corporeal and animal passions, rendered insatiate by morbid cravings and disorders of all kinds, and in repairing, or rather attempting to repair, the mischiefs and miseries induced by bad habits. The intellectual and moral mind, the *spiritual* nature, has but little opportunity for cultivation and development until the later periods of life, and then the body is worn out, and the mind has nothing to sustain it. Even the rich stores of knowledge accumulated by those who are placed in circumstances peculiarly fortunate for moral research and scientific investigation are mostly lost to others, because their voluntary habits have so disordered the body, that the lamp of life goes out before they have time to arrange, compare, prove, and demonstrate the results of their study and experience, and communicate them to the world. The "uncertainty of life," which hangs like a depressing incubus upon the majority of minds, has a blighting effect on human intellect, and a demoralizing influence on human affections. As most people live, they feel an assurance of a special liability to some "mysterious providence," which *may* at any moment terminate their existence, and that entirely independent of any natural cause or law which they can either understand or control. The state of mind induced by such confused fears and apprehensions must be exceedingly superstitious, and nothing is more stupefying to all the powers of intellect than superstition. Such persons cannot reason well because their reflective powers are spell-bound by an absurd fantasy, and they dare not attempt to reason much for fear they will reason wrong. Imagining their safety to consist in the passive instead of the active state of mind, they make "discretion the better part of valor," and try harder to believe than to understand. But, moreover, this blinded and bigoted state of mind renders its possessor eminently short-sighted and selfish. He is unwilling to trust God, man, or nature, and aims to make sure of every thing, and enjoy as he goes along. Hence he is always pursuing petty expedients for momentary pleasure, instead of seeking permanent and substantial happiness in following out the laws of his

organization. He becomes in society one who seeks to *appropriate* as much as possible, and *impart* as little as possible. He is always pre-eminently conservative, uniformly goes for keeping all things as they are, and invariably opposes all new creeds, or innovations upon established usages. So far as society, or the world, or the human family is concerned, he is useless, or rather worse than useless. But let the same person be well instructed in the philosophy of life, let him feel competent to preserve his own health, and have a full assurance that, casualties excepted, his days may be long in the land, and he will straightway look forward to a better and higher destiny, forego many present temporary gratifications, discipline his mind for the more important future, and become a more useful as well as more happy member of the social compact. Instead of finding his pleasure in abstracting all he can from the enjoyments of others, he will seek and find his highest happiness in some pursuit which will be conducive to the general good.

Special Means Conducive to Longevity.—In strict truth there are no *special* means for promoting health and attaining longevity, except in the negative sense—the avoidance of special errors. The *general* adaptation of all the hygienic agencies to the particular circumstances in which we are placed, constitutes our proper rule of action. But there is one principle involved in this subject more important than any other, and as it is more disregarded, and probably less understood, by people generally than any other, it may be well to notice it specifically in this place.

We have seen that, from the cradle to the grave, the proportions of the solid particles of the body are constantly gaining upon the fluids; natural death resulting when, provided no disease intervenes, the consolidation of the structures has progressed so far that the fluids cannot permeate the capillaries sufficiently to maintain the functions of assimilation and depuration. As the fluids and solids are both formed mainly from the materials taken into the stomach as food and drink, it follows that the character of the aliment has a controlling influence, beyond that of any other hygienic circumstance, in determining the period when natural death shall take place. Gross, concentrated, obstructing food, and all extraneous earthy or saline ingredients accidentally mingled with our food and drink, or employed as condiments, must necessarily abridge the term of our existence. All the early historians agree that the primitive inhabitants of the earth were *frugivorous*, subsisting mainly, if not wholly, on fruits. But if the primitive inhabitants employed as food roots, and tender leaves, and plants as well as fruits, they still had a

kind of aliment remarkably fluid and unconcentrated as compared with the dishes generally eaten at the present day. And if, further, they employed any of the cereal grains—as flouring-mills were then unknown, and no method had been devised for separating the bran from flour—they were used in their most perfect condition, both as respects quality and preparation. The flesh of animals, it is conceded on all hands, was not then even thought of as food for human beings. So far, then, as the dietetic habits of the immediate descendants of the first pair were concerned, they united all the conditions requisite to prolong life to the utmost limit of the laws of life.

The principle, therefore, seems established, that the kind of food which contains a large proportion of fluid, as compared with its solid matter, and a large proportion of bulk, as compared with its nutriment, is best adapted to sustain permanently the integrity of the organism, provided it contain also the requisite elements for prolonged nutrition. Those who employ a diet largely farinaceous—those who make bread "the staff of life" in their dietetic system, require a large proportion of cruder vegetables, less nutritious roots, or succulent fruits. True, an individual might do very well on "bread alone," if he were rigidly abstemious, but the tendency would be, if the habit were extended through several generations, to hasten the consolidation of the structures, and bring on premature old age.

Nearly all the arts of commerce and of cookery are, and have been for many centuries, directly calculated to disorder the human body, and shorten the duration of its existence. Concentration, stimulation, and complication, with many extraneous additions, have generally been the aim of the cook, and the prescription of the physician; and the result is, that disease is the general rule of society, and health the exception, while the average period of time between birth and death has been fearfully diminished.

Another advantage in employing a large proportion of watery fruits and vegetables is, in supplying the system in this way with the water it requires, in its purest state. Most of the water used as a beverage and for cooking purposes is more or less impregnated with deleterious particles, while that found in the juices of fruits and vegetables is nearly free of every thing of the kind. We know that the organic economy requires a due supply of certain earthy matters, as phosphate and carbonate of lime, for the sustenance of the osseous system; but it is obvious that an undue supply must obstruct the minute ramifications of vessels, and render the fibres rigid and friable. The depurating organs have the functional ability to secrete and expel from the body the surplus saline and earthy matters to a certain extent; but if

they are taken into the system beyond that ability, they must necessarily accumulate constantly, and exercise a very important influence in bringing the functions of life to an early termination.

I admit that a stimulating, concentrated, and even constipating and obstructing regimen, may produce a rapid development of the body it may produce extraordinary precocity in mind or body, or both But it is a *kind* of development unfortunate for its possessor and for society It is a process which makes the child a *giant* and the man a *dwarf*. It may produce manifestations of maturity at twelve, and symptoms of decay at twenty. Besides, it always and invariably disorders the individual; and if, haplessly, the forced production of a man propagate his kind, the offspring will inherit a malformed and imperfect organization.

It has been urged, with reason, too, that the difficulties and pains of child-bearing are closely connected with the quality of food, as regards concentration. There is little doubt, I think, that the structures of both mother and child are more inflexible, inelastic, and unyielding, when the food has been too stimulating, too concentrated, or in any respect obstructing—a condition which obviously complicates the dangers and aggravates the sufferings of parturition. In fact, this subject has been amply and practically illustrated during the last seven or eight years in the city of New York, where nearly all the mothers and infants treated on the ordinary or allopathic system have experienced great suffering, and been "doctored through" many diseases; while all, as far as I have any knowledge, treated hydropathically, have escaped a great degree of the usual suffering, and *all* of the diseases usually incident to the lying-in period.

A late author, who has perpetrated the very common mistake of taking a fact for a principle, and a principle for a theory, and a theory for a system, and then turning the system into a *hobby*, has undertaken to show that all kinds of foods and drinks are conducive to or detractive from longevity, exactly in the ratio that their constituents contain less or more of saline or other earthy ingredients. According to his notion *wheat* is the very *worst* article of food known; the other grains are highly deleterious, while all kinds of "fish, flesh, and fowl," and even *ardent spirits* and *tobacco*, are healthful, because they contain scarcely any *phosphate of lime* or other earthy matters! As a specimen of his reasoning, or, rather, misapplication of facts, I make the following extract from his work, especially as it is a fair sample of the manner in which facts are generally misapprehended or misapplied by the medical profession:

"The peasantry of those parts of Ireland where wheaten-bread, or

any kind of grain food is scarcely ever tasted, but where potatoes, fish, turnips, greens, and fresh vegetables, generally form their principal diet, all of which things contain a moderate amount of earthy matter are proverbial for health, activity, and a tolerable longevity. The English peasantry consume one half more solid grain food, as bread and pastry, than the Irish, and are greatly inferior both in health, activity, duration of life, and in temper and disposition. Although the same external conditions, fresh air and exercise, and much better clothing and lodging, are enjoyed by the English, they are more bony, rigid clumsy, and stupid than the Irish."

I think the *fine flour*, with the greater portion of *beer*, *beef*, and *plum-pudding*, accessible to the English peasantry, explain these phenomena perfectly.

Occupation as Affecting Longevity.—The industrial relations of individuals, though important, are less so than domestic conditions and circumstances, as influencing the duration of life. The acknowledged theories and the collected statistics of physiologists exhibit some discrepancies, with regard to the connection between occupation and longevity; and medical men have been utterly unable to explain or reconcile these discrepancies. Thus, while agriculture is universally allowed to be the most healthful occupation known, the average lives of farmers, though comparing favorably with mechanics, tradesmen, laborers, factory operatives, etc., is lower in the scale of longevity than that of several other classes. In some parts of England, where this subject has been investigated, particularly in Manchester and Rutlandshire, the "upper classes," or "gentry" were found to be nearly twice as long-lived as the "lower classes," or "workers." These facts require a thorough analysis, or we shall be led into the monstrous absurdity that idleness and dissipation are more conducive to health than industry and temperance.

With regard to a farmer's life, it must be remarked that, although accompanied with good air, early rising, out-door exercise, and regular habits, these advantages are in a great measure counterbalanced by bad water and bad food. It is true that farmers *ought* to be the healthiest people in the world; but, unfortunately, they are very ignorant or negligent of the *means* of health which are so abundantly at their disposal. With ample facilities for enjoying the best possible diet, they generally employ the very worst. Hard water is usually drank, and, in this country particularly, stale salted meats, superfine flour, greasy compounds of all kinds, and butter and cheese, constitute the essentials of their dietary system; fruits and the more watery

vegetables being regarded almost entirely in the light of luxuries or seasonings, which may be dispensed with or sent to market, or, if employed at all, are so saturated with sugar, butter, vinegar, salt, pepper etc., as to be really worse than none.

Cities are universally reputed to be unhealthful residences; and this fact puts the inhabitants on their guard—*compels* them to study, in some degree, the laws of life and health. Their greater exposure to danger becomes the means of rendering them more intelligent; and the caution they exercise in the selection of the articles and qualities of their foods, very nearly balances the natural advantages of the rural districts. The difference between fresh meat and salted, as an article of diet, is very great; and in this respect the inhabitant of the city has a vast advantage, because in cities fresh meat is the staple article of animal food, and salted the exception; the reverse being true in the country. It is not easy to convince the farmer that he can labor without old pork, bacon, or salted beef; but these articles are nevertheless among the principal causes of his rigid muscles, stiff gait, numerous infirmities, and premature old age.

The "upper classes" have the advantages of selected locations for their dwellings, plenty of room, clean yards, well-ventilated sleeping apartments, and favorable external circumstances generally. The poorer classes generally occupy the insalubrious localities because they are cheaper, rear buildings, garrets, cellars, etc., circumstances which will always very materially abridge the period of existence. It is true that laborers are not generally fairly dealt with by capitalists, but it is equally true that laborers have all the means requisite to improve their condition, and become completely independent. Their misfortune is, they know not how to use those means. Their great error, and the grand source of their slavery from generation to generation, is in their dietetic habits. Three or four times as much money is expended on articles of food which give them imperfect nourishment, and render them liable to diseases, with loss of time, and doctors', nurses', and apothecaries' bills accumulating, as is necessary to afford them healthful sustenance, if rightly applied. The money saved by a correct regimen would procure them better residences, and admit of an annual deposit in some savings' bank, in view of a future homestead. It is a fact that, in the United States, and indeed in almost any other country, perhaps in all, wages are sufficient to emancipate the laborers from the thralldom of capital in a very few years, if the "toiling millions" would but make a judicious application of their earnings.

There are some occupations necessarily unwholesome, and requiring special precautions on the part of those who pursue them. Millers

cotton-spinners, tea and coffee-roasters, paper and machine-makers, iron and brass-filers, glue and size-boilers, tallow chandlers, etc., are exposed to an atmosphere loaded with powders or gases which exert a deleterious influence on the lungs. Thorough ventilation, and a position "to windward" of the current of floating particles, are indispensable considerations. Plumbing, painting, and the arts of the operative chemist, potter, and coppersmith, are deleterious, to some extent, from the substances which are volatilized by various processes being inhaled. Experiments in relation to lead-poisoning, however, have shown that workmen in smelting establishments, house-painters, etc., are injured far more from the metallic particles which adhere to their hands and clothes, thence finding their way into the stomach, than from absorption through the skin, or inhalation into the lungs. The proper precautions consist in changing the clothes before going to meals, and thoroughly washing the hands, carefully removing every particle of paint or metallic matter from under the finger-nails. Gold-finders are exposed to sulphureted hydrogen gas, which is exceedingly poisonous.

Severe mental exercise, or close application to study, has usually been considered as unfavorable to long life. This is undoubtedly true as relates to childhood and early youth. The bodily powers are often stunted, the mental functions blunted, and the whole constitution ruined by too early confinement to study. But there is another evil of immense magnitude connected with this view of our subject. Children and youth require much, varied, and regular muscular exercise during the period of bodily development. If the natural instinct for abundance of out-door exercise is repressed, the whole system becomes morbidly sensitive and irritable, and this condition, under the usual stimulating and enervating habits to which youth are so generally the subjects and the *victims*, such as tea and coffee, flesh eating, excessive clothing, feather beds, etc., is aggravated and intensified, until inflammatory secretions and ungovernable passions disorder the whole body, and unbalance the mind. In this state young persons are easily led into any habits of dissipation and debauchery which their associates or superiors are addicted to. The numerous examples of self-pollution or masturbation among studious young men and boarding-school girls, surely undermining the constitution, and laying the foundation for a brief life of infirmity and suffering, are melancholy evidences of misdirected educational enterprises. The duty, therefore, of bringing every child up to some useful business pursuit, in which the surplus animal energies may be profitably and regularly expended, seems absolutely indispensable to its safety as well as to the good of society; a duty the neglect of which has caused so many sons of wealthy

parents, who were so mistaught as to look with contempt upon honest toil, to turn out debauchees and vagabonds.

But intellectual pursuits, or avocations which severely tax the moral powers and higher propensities, do not seem to be inimical to high health and great longevity, when followed with a consistent regard to general hygienic precepts. Dr. Madden, in his "Infirmities of Genius," has given us tabular statements which go to show that those literary pursuits in which the imagination is vigorously exerted are more inimical to longevity than scientific and philosophical avocations. He also thinks that "the earlier the mental powers are developed, the sooner do the bodily powers begin to fail;" a remark which is correct only so far as it applies to the prevalent method of forcing the intellect into premature and precocious exertion, at the expense of the body. Poets and artists are rather noted for early deaths, but they have usually been irregular and dissipated in their habits. Eminent theologians, philosophers, physicians, lawyers, jurists, etc., have died very frequently of apoplexy or palsy; but they were frequently addicted in the later periods of life to "luxurious feeding." Many individuals are designated by historians as "victims of excessive mental application," who were truly victims of intemperance. Dr. James Johnson, mistaking the *abuse* of the body for the *use* of the mind, has expressed the absurd opinion that "a high range of health is probably incompatible with the most vigorous exertion of the mind, and that this last both requires and induces a standard of health somewhat below par." This error of Dr. Johnson has arisen from observing that certain intellectual geniuses—Virgil, Horace, Pope, and others—were of feeble bodily health. It is much more rational to suppose that if "men of genius" would take better care of their bodies, they would manifest still more vigorous and enduring minds, than to impute what mental talent they do possess to bodily infirmity.

Sad examples of the same mistake may be seen at all our seminaries of learning, where bodily infirmity and mental genius *appear*, to the superficial observer, to stand in the relation of cause and effect. But, however satisfied and gratified teachers and parents may be with the "highest prizes" won by haggard faces, contracted chests, gaunt abdomens, and dreamy slumbers, the true physiologist can only see, in the not distant future, sure-wasting consumption, hydra-headed dyspepsia, crippling palsy, or nameless debility, as the probable consequence of this working of the machinery of mind out of all proportion to the bodily development; *he* must lament, while short-sighted friends rejoice at the prospect.

PART IV.

DIETETICS.

Preliminary Remarks.—All intelligent physicians of all schools of medicine agree in the general proposition that plain, simple, natural food is most conducive to the recovery or preservation of health; but when we come to the details as to what constitutes plain, simple, and natural food, these same physicians are at all points of the compass. Even hydropathic writers, who are singularly harmonious on every other subject in relation to their system of the healing art, are somewhat discordant on this. The fact, however, may not result so much from differences of opinion as to what is intrinsically true in theory, as from different views as to what is expedient to attempt in practice.

One remark of the author of the "Science of Human Life," all true hydropaths will have abundant opportunity to verify, viz.: "The more the practice of the physician conforms to the appetites of his patients, the more cheerfully and generously is he rewarded." Two dollars a day is not regarded as extravagant at a "first-class hotel," where the guests are provided with "every comfort" which renders them invalids; but one dollar a day at a hydropathic establishment, where they are forced to bear with all the privations that are necessary to restore them to health, is considered exorbitant; so difficult is it for the majority of people to reason against the current of their appetites, and understand in opposition to the impulses of passion and habit. This consideration, too, which all persons who practice a reform system in opposition to the acquired desires and immediate pleasures of their customers must be frequently reminded of, may not be without its influence in determining the general character of many hydropathic tables, and possibly of biasing the opinions of hydropathic practitioners; for that man must be ignorant of human nature who does not know how easily judgment is warped by interest.

I do not know that it is practicable or possible, amid the prevailing ignorance and error, to sustain a hydropathic establishment, or any

other public institution, on a dietary system strictly physiological. A majority who are compelled to resort to the water-cures, of course, have been more or less mistaught; nor can their errors be wholly educated out of them at a single interview. "Line upon line, and precept upon precept," even when commended and enforced by personal example, are necessary to change the current of deeply-rooted habits and ever-craving propensities.

A large proportion of patients who for the first time visit these "cures" for the purpose of treatment, expect a change from their accustomed habits of eating and drinking to something more healthful. But *such* a change! Many of them are startled with astonishment on their first appearance at a hydropathic table. They had *heard* of the beautiful brown bread, the exhilarating *cold* water, the substantial hominy, the admirable rice, the tempting fruits, the dainty baked potatoes, the delicious *greens*, and the keen appetites; but while it was, perhaps, "*distance* that lent enchantment to the view," they were pampering the artificial appetite with rich dishes, and condiments, and seasonings. When, therefore, the matter is submitted to the evidences of the senses, the wheaten grits scratch the throat, the beef-steak is too dry to swallow without gravy, the bread will not go down smoothly without butter, spinach is insipid without vinegar, pudding is flat without wine-sauce, pea-soup is uninviting without pepper, pumpkin pie is odious without ginger, pastry has no relish without the accompaniment of cheese, and the biscuits are too tough to "melt in the mouth" without shortening. If perchance an article finds its way to the table by accident, or by the carelessness or connivance of the cook, in all respects what it should not be, it is morally certain to receive a warm eulogium; while the articles selected with the greatest care, and prepared with the utmost pains-taking, and in every way precisely adapted to cure their maladies in the shortest possible period of time, are as certainly treated with dignified neglect or open ridicule.

This I know is an extreme view, but not an uncommon reality, and these circumstances may justify, if they do not compel, hydropathic tables to be, to some extent, compromises with custom. Many patients, with a full understanding of the subject, prefer to have a greater indulgence in matters of appetite, and submit to the severer water processes such indulgence renders indispensable, in order to effect a cure. But the evil is not wholly on the side of the inveterate errors and perverse appetites of patients. Some persons who undertake to get up a hydropathic table are entirely ignorant of the whole subject of diet; some pretended establishments are merely "watering places," the table being wholly on the ordinary hotel plan. There is, too, some

difficulty always attending the preparation and maintenance of a well regulated table for invalids, for the reason that competent help is not easily found; and again, the commercial adulterations of the materials of food, and the bad qualities so profusely furnished to our markets, require the closest attention and the most careful scrutiny.

But all of these difficulties are surmountable; errors of education are not necessarily fatal, morbid appetites are not absolutely incorrigible, and a clear understanding of the causes, sources, nature, and remedies of all of them, is the pre-requisite for introducing a better order of things. The aim of the enlightened hydropath in directing the dietetic practices of his patients, will be not only to cure their present infirmities, but to teach them "the way of life" in relation to eating as well as to all other voluntary habits. And to this end he should for himself well understand, and for others ever hold out to view, correct physiological principles, although he may rightfully exercise a wide range of discretion in the particular manner of conforming and reforming the habits and appetites of his patients, so as to induce them intelligently to love and permanently to practice "the better way."

CHAPTER I.

DIETETIC CHARACTER OF MAN.

The arguments involved in the question whether man is by nature best adapted to subsist on a vegetable diet exclusively, or on a mixed diet of vegetable and animal food, can hardly fail to be interesting and profitable to all, although all may not draw the same inferences from the facts presented. Those who will attentively study Sylvester Graham's work on the Science of Human Life, will find this whole subject critically investigated and philosophically demonstrated. In the present work it is impossible to give more than a brief abstract of the positions and evidences bearing on the general proposition.

The Bible Evidence.—We learn from the first chapter of Genesis that, as soon as man was created, and placed on the earth, to "multiply, and replenish, and subdue it," his food was appointed in the following words: "And God said, Behold, I have given you every herb bearing seed, which is upon the face of all the earth, and every tree

in the which is the fruit of a tree yielding seed; TO YOU IT SHALL BE FOR MEAT." Certainly nothing can be more clear and explicit than this declaration, that the vegetable kingdom is the ordained source of man's sustenance.

But after the flood it is said that animal food was *permitted*. It seems to me a very strange moral hallucination that arrays a *permission* to do one thing against a *command* to do the contrary! Those who prefer to make a permission instead of a command their rule of action will find, on a careful examination of the Scriptures, that wars, murders, polygamy, pestilences, famines, and many other vices and evils, have been permitted, "for the hardness of men's hearts." This doctrine of permission is derived from Genesis ix. 2, 3, 4: "And the fear of you, and the dread of you, shall be upon every beast of the earth, and upon every fowl of the air, upon all that moveth upon the earth, and upon all the fishes of the sea; into your hand are they delivered. Every moving thing that liveth shall be meat for you; even as the green herb have I given you all things. But flesh with the life thereof, which is the blood thereof, shall ye not eat."

To my understanding this permission only more strongly enforces the prior commandment. If we may suppose that man, after the earth had been peopled for several centuries, by reason of some set of circumstances we cannot now ascertain, resorted to flesh-eating, in consequence of which he became so brutal, and ferocious, and depraved, and wicked, and filled the land with so much violence, that it was found necessary to wash the whole surface of the earth clear of his polluting presence, saving only a single family to preserve the race from utter extinction; and if then Jehovah had seen fit to reaffirm His original law in the appointment of man's food, the language employed, it seems to me, is admirably adapted to the purpose.

The *fear* and the *dread* of man was stamped upon the whole animal creation. This implies that man's *supremacy* above the lower animals was again pointed out. It did not ordain man to be a predaceous animal himself, but affirmed his *superiority*. But into man's hands was the whole animal kingdom *delivered*. Well, for what purpose? To eat? Not to *devour*, but to *protect*. To rule and hold dominion over, not to ravage and prey upon. Or even if man were ordained to destroy and exterminate the animal kingdom, it would not follow that it was his duty to eat and digest it. God constituted man the *lord* of creation; was it not an egregious blunder in man to mistake himself for the *tyrant* of all?

The inferior races of men fear and dread the superior; in fact, for all practical purposes, the weaker are "delivered" into the hands of

the stronger. But would it not be a perversion of privilege for the more powerful to *eat* the more feeble, especially when there was abundance of good wholesome food obtainable otherwise? If man is placed at the head of creation, formed and fashioned but little lower than the angels, and so much *above* the animal kingdom as to have dominion over it, his duty seems to be to protect and govern it, not sensualize and riot upon it. The fear of God and the dread of the Almighty is upon every human being who walks the earth; but human beings look up to that Deity whom they both fear and dread, as the best of protectors, the most merciful of rulers, the kindest of fathers If Queen Victoria has dominion over thirty millions of her fellow-creatures, she would be a very cannibal to eat a single one of them; and if a hundred millions of semi-civilized human beings are delivered into the hands of Nicholas of Russia, it does not imply his right to maltreat or destroy, much less devour them!

No one pretends to say that all sorts of *dead* animals were meant by the phrase, "every thing that *liveth*;" and if it does not include *all* animals, why does it mean *any?* Surely the language is as broad as creation itself. But mark! Vegetable food is, indeed, a "living thing," after harvest, and even when prepared for the table. The grains, and fruits, and roots still retain the living seed, the germ of vitality, even at the moment when they are ready for man's repast True, their germinating property may be destroyed by a process of cooking, but this militates nothing against our position.

Now, animal food (save those trifling exceptions, raw fresh eggs and raw fresh oysters) of whatever kind, is not "living;" and it immediately commences putrefying the moment it is deprived of life; and this process of decomposition can only be arrested by powerful antiseptics, as salt, vinegar, sugar, alcohol, nitre, arsenic, etc.

Again, while man's dominion was to be over *all that moveth upon the earth*, his ordained food was to be *every moving thing that liveth* Those things that *move upon* the earth are most indubitably the animals that creep, crawl, walk, run, jump, climb, fly, and swim. The *moving* things that *live*, when gathered and preserved for food, as well as when growing in the fields and woods, are the waving grains, the spreading vines, the branching roots, the swelling fruits, etc.

Lastly, those who contend for flesh-eating on Bible authority admit that blood is peremptorily forbidden. This admission on their part completely refutes all the appearance of force they draw from their own interpretation of the doctrine of permission, for they never eat a particle of flesh, and *would not eat it*, without a large admixture of blood. A piece of flesh deprived of its blood is a dry, fibrous, stringy

unsavory mass; no one would eat it sooner than he would eat a piece of sponge or India-rubber. Yet who does not know that "steaks" and "roasts" rare-done, so as to bleed a little when carved, are considered by Christian epicures generally as the sweetest, daintiest cuts? Even blood-puddings are considered a famous luxury by some of those good Christians who profess to be, and no doubt really imagine they are, obeying the commands of holy writ in the use of animal food.

It is admitted that both the Old and the New Testaments furnish examples of good men, and inspired men, who ate flesh; but good and inspired men were neither all-wise in intelligence, nor all-virtuous in conduct. Though good and inspired, they were still the subjects of ignorance and error—they were human. Nothing, however, is more apparent than the superiority which the whole tenor of Scripture teaching assigns to vegetable food. The history of Daniel, and John the Baptist, and Elijah the Prophet, are striking illustrations. Whether our Saviour ate the animal fish is a question perhaps not easily solved, nor is its solution material to our purpose. But it is worthy of notice that the lotus plant of the Egyptians is, even at this day, made into an edible preparation called fish. The Greek word *opsarion*, it is said by some lexicographers, does not signify fish, but some other delicate preparation eaten with bread. James and John were fishermen, with Zebedee their father, yet Calmet says that they never ate fish or flesh. Ezekiel speaks of an abundance of fishers who should live on the borders of the Dead Sea, yet Josephus says no animal fish will live in it. The balance of testimony is certainly strongly against the supposition that fishermen were fishers of animals in those days, or that the fish employed as food was not a vegetable production.

The Mosaic regulations in relation to animal food were evidently intended to restrain its employment, as far as the sensual people he had to deal with could be controlled, and to restrict those who would persist in its use to the best or least injurious kinds. But, stranger truth than the strangest fiction, many of our good modern Bible-professing Christians, who devoutly believe in "Moses and the prophets," make their dainty delicacies and luxuries on the very kinds of animals and parts of animals which Moses, with the authority of "thus saith the Lord," peremptorily prohibited.

The Anatomical Evidence.—To the Bible testimony in favor of vegetable diet, may be added that of comparative anatomy. Natural history alone solves the problem beyond all controversy. Medical writers are constantly asserting, and newspaper scribblers are continually reiterating the statement that the conformation of the human

body shows that man is intended to live on a mixed diet of animal and vegetable food; but neither of them support the position with a particle of evidence which can bear criticism. On the contrary, all the eminent naturalists the world has ever produced, as far as I know, are unanimous in the opinion that the anatomical structure of the human body, as compared with other animals, places man among the frugivorous or herbivorous animals, and affords no testimony whatever of his carnivorous or omnivorous character.

Baron Cuvier, whose name stands at the very head of comparative anatomists, says: "The natural food of man, therefore, judging from his structure, appears to consist of fruits, roots, and other succulent parts of vegetables, and his hands offer him every facility for gathering them. His short and moderately strong jaws, on the one hand, and his cuspidati being equal in length to the remaining teeth, and his tubercular molares on the other, would allow him neither to feed on grass nor devour flesh, were not these aliments previously prepared by cooking."

Professor Lawrence states that "the teeth of man have not the slightest resemblance to those of carnivorous animals, except their external enamel, and that the whole human structure most closely resembles those animals which are naturally frugivorous—the *simiæ*, or monkeys."

Thomas Bell, surgeon-dentist to Guy's Hospital, declares that "every fact connected with the human organization goes to prove that man was originally formed a frugivorous animal."

Linnæus asserts that "the organization of man, compared with that of other animals, shows that fruits and esculent vegetables constitute his most suitable food."

Sir Everard Home admits that "while mankind remained in a state of innocence, their only food was the produce of the vegetable kingdom."

Lord Monboddo, also a celebrated naturalist, says: "It appears to me that by nature, and in his original state, man is a frugivorous animal, and that he only becomes an animal of prey by acquired habits."

Dr. William Lambe, of London, after a critical examination of the question, came to the conclusion that "man is herbivorous in his structure," and his conclusion has been verified by more than forty years of personal vegetarian experience. He declares that "the adherence to the use of animal food is no more than a persistence in the gross customs of savage life, and evinces an insensibility to the progress of reason, and to the operation of intellectual improvement."

Sylvester Graham, of Northampton, Mass., with a mind singularly

constituted to grasp first principles, has carefully examined the whole organization of the human body, and minutely investigated all its complicated parts, with direct reference to this question, more thoroughly probably than any other person who has ever lived. His theoretical conclusion corresponds with that of all other naturalists whose attention has been directed to the subject, and the experience of hundreds who have adopted the vegetarian system, partially or wholly, in consequence of his teachings, singularly exemplifies its truth.

Against such testimony we have nothing but the bare assumption of medical and dietetical writers who have never examined the subject at all, and who are as profoundly ignorant in relation to it as are those for whose edification they write. It is common and customary for such persons, whenever they make a book on any subject pertaining to medicine or hygiene, to repeat the stereotyped phrase that the *teeth* of the human animal combine the characters of both herbivorous and carnivorous animals, and constitute him an omnivorous, or all-devouring animal. This makes him one of the connecting links between the two, and places him dietetically in the same dignified rank in the scale of being as the bear, hog, etc. The manner in which the omnivorous side of the question is supported is much more amusing than convincing. Dr. Dickson, the author of Chrono-Thermalism, *modestly* observes: "The most cursory examination of the human teeth, stripped of every other consideration, should convince any body *with the least pretensions to brains*, that the food of man was never intended to be restricted to vegetables exclusively."

Dr. Carpenter *(Principles of Human Physiology)*, in allusion to the carnivora and herbivora, remarks: "Now, the condition of man may be regarded as intermediate between these two extremes. The construction of his digestive apparatus, as well as his own instinctive propensities, point to a mixed diet as that which is best suited to his wants."

Dr. Dunglison (*Human Health)* makes the following singularly ridiculous assertion: "There is no doubt whatever, that if, from infancy, man, in the temperate regions, were confined to an animal banquet, it would be entirely in accordance with his nature, and would probably develop his mental and corporeal energies to as great a degree as the mixed nutriment on which he usually subsists."

Professor Lee, who has a happy talent for "coinciding" in the opinions of others, fully endorses the "very judicious remarks" of Dr. Dunglison, and also remarks, on his own responsibility: "The physical organization of man proves that he is destined for a mixed kind of aliment"

A volume of similar quotations could be extracted from the medical authors of the allopathic school; but all alike are deficient in argument or evidence. When an attempt at argument is made, it always turns on the teeth and masticatory organs. These are said to be in man a little different from both carnivorous and herbivorous animals; and hence the inference is drawn that man, because he is *unlike either*, is actually *both*. There is, indeed, a resemblance between the teeth of man and the teeth of both the carnivora and herbivora, as well as those of the omnivora; but there is, too, a difference, and the difference is just as significant as the resemblance. The truth is, that there is a *very wide* difference between the teeth, masticatory organs, and whole digestive apparatus of man and carnivorous animals; a *great* difference between man and omnivorous animals in these respects; a *lesser* difference between man and the *herbivorous* or graminivorous animals; and an *exact resemblance* between man and those animals known to be frugivorous. The single fact that man possesses the *lateral* or *grinding motion* of the lower jaw, peculiar to frugivorous and graminivorous animals, while he is destitute of the pointed, projecting, irregular, and tearing teeth, belonging to carnivorous and omnivorous animals, is perfectly conclusive, in my estimation, as far as anatomy is concerned, that man is by nature in no sense or degree associated, dietetically, with the latter classes of animals.

But for the satisfaction of those who desire to *see* as well as hear the discussion of this subject, the following ocular demonstration is submitted:

Fig. 152.

TIGER'S UNDER JAW.

Fig. 152 exhibits the masticatory organs of the carnivorous tiger. There is a *resemblance* between these teeth and those of the human animal; yet no one will dispute that the *difference* is more striking than the resemblance.

Occasionally the human teeth exhibit those deviations from the ordinary form which are denominated *tushes;* but such deviations are universally regarded as deformities, and such deformities always give a carnivorous and ferocious expression to the countenance. How little do human beings suspect the intimate connection that exists between mental impressions and exercises and bodily conformation. Those tribes of the human family whose minds are most associated with animal food, and whose teeth are most frequently

employed in masticating it, are most distinguished for a structure of teeth peculiarly *inhuman*.

Fig. 153.

JAWS AND TEETH OF A PANTHER.

In Fig. 153 we have a representation of the jaws and teeth of another purely carnivorous animal. It affords a good idea of the manner in which the jaws of the carnivora open and shut, like a pair of shears, being wholly incapable of the least grinding or rotary motion.

Fig. 154.

JAWS AND TEETH OF A MINK.

Fig. 154 represents another modification of carnivorous masticators. The teeth are nearly closed, and the dagger-like tusks are seen to be very different from those teeth which, in the human jaw, have received the appellation of *canine*.

Fig. 155.

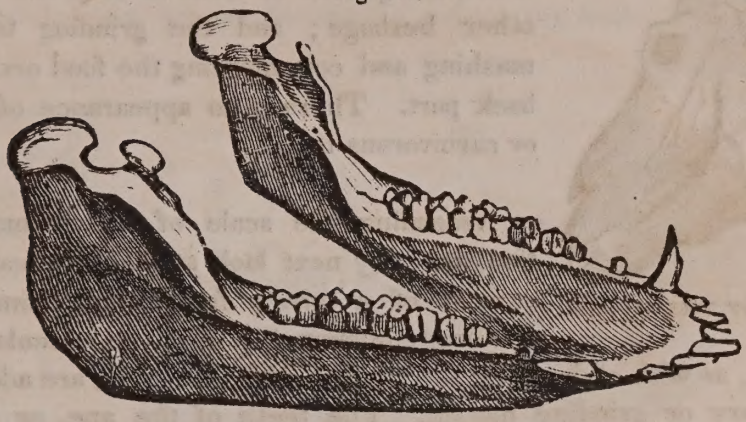
YOUNG LION.

The face of the young lion, Fig. 155, does not make any very near approach to humanity, in the conformation of the teeth or jaws. A *resemblance*, of course, must be acknowledged; yet, when the general contour and expression of the human face approximates to that of a carnivorous animal, it is by common consent denominated "savage," "ruffianly," etc.

The poets and painters who undertake to represent to us their ideal of humanity invariably divest the features and expression of every trace characteristic of the ascendency of the lower range of animal propensities How would the "Portrait of a Gentleman," the "Flower Girl," "The Bride," or "The Cavalier," appear in the gallery of the American Art

Union, with the angles of the mouth drawn down to the carnivorous range, and the canine teeth projecting omnivorously beyond the rest?

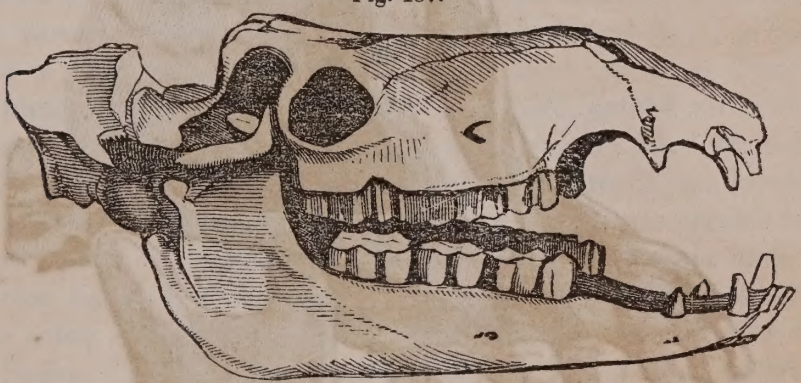
Fig. 156.



UNDER JAW AND TEETH OF THE HOG.

We may now examine the intermediate class—the omnivora. The back teeth of the hog, Fig. 156, resemble exactly those of herbivorous, and the front teeth those of carnivorous animals. But if there is any thing peculiarly human about the masticatory apparatus of the swine. I am unable to perceive it.

Fig. 157.

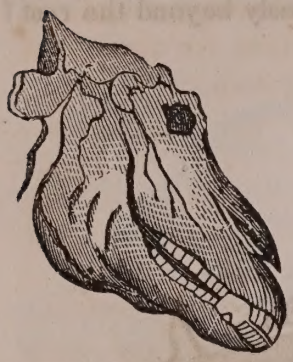


JAW AND TEETH OF THE CAMEL

The masticatory organs of the camel, Fig. 157, particularly the cuspid or canine teeth, show a much stronger resemblance to those of carnivorous animals than do those of the human animal; hence man, judging from the point of comparative anatomy alone, would be removed further from the carnivora than even the camel, which subsists on the coarsest herbage.

The irregular arrangement of teeth are here peculiarly fitted for clinching and breaking up the sprouts, stalks, branches, etc., which constitute a large proportion of this animal's food.

Fig. 158.



SKULL OF THE HORSE.

In the jaw of the horse, Fig. 158, another herbivorous animal, the incisors, or cutting teeth, are placed in front to crop the grass or other herbage; and the grinding teeth for mashing and comminuting the food occupy the back part. There is no appearance of tearing or carnivorous teeth.

Ascending the scale of the animal creation, we may next look at the masticatory apparatus of a purely frugivorous animal. In the orang-outang, Fig. 159, the articulations of the jaw, as with all herbivorous animals and with man, are adapted to the rotary or grinding motion. The teeth of the ape, or monkey

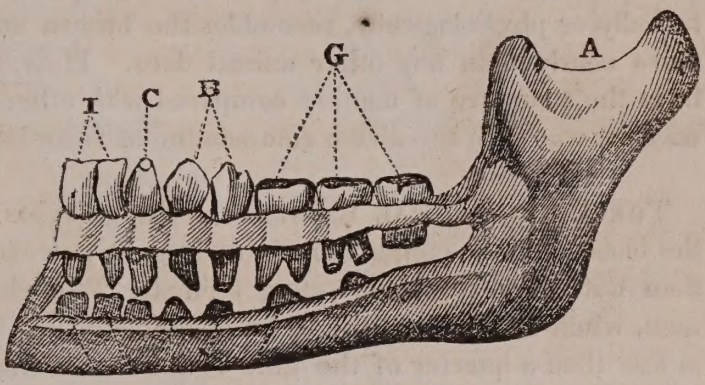
Fig. 159.

JAWS AND TEETH OF AN ORANG-OUTANG.

tribe, have a nearer resemblance to those of carnivorous animals than have human teeth, which fact would place men, if possible, at even a greater distance than the orang-outang from the carnivora It should

be noticed, however, that in some species of monkeys—the baboon for example—the cuspids do resemble the corresponding teeth of carnivorous animals, an arrangement which serves them for weapons of offense and defense, but not for cutting and tearing flesh.

Fig. 160.



HUMAN JAW AND TEETH.

It will be observed at a glance that the masticatory organs of the human animal, Fig. 160, are still further removed from all resemblance to those of carnivorous or omnivorous animals than are those of the purely frugivorous orang-outang, or the purely herbivorous animals. The incisors (I) are evidently intended for biting and cutting the fruits, grains, roots, or other vegetables designed for his subsistence; the cuspid, corner, or canine tooth (C) enables him to grasp more firmly and retain more securely the alimentary substance; and the bicuspids (B) and molares (G), or small and large grinders, are fitted to mash and grind all dry, solid, or hard articles of food.

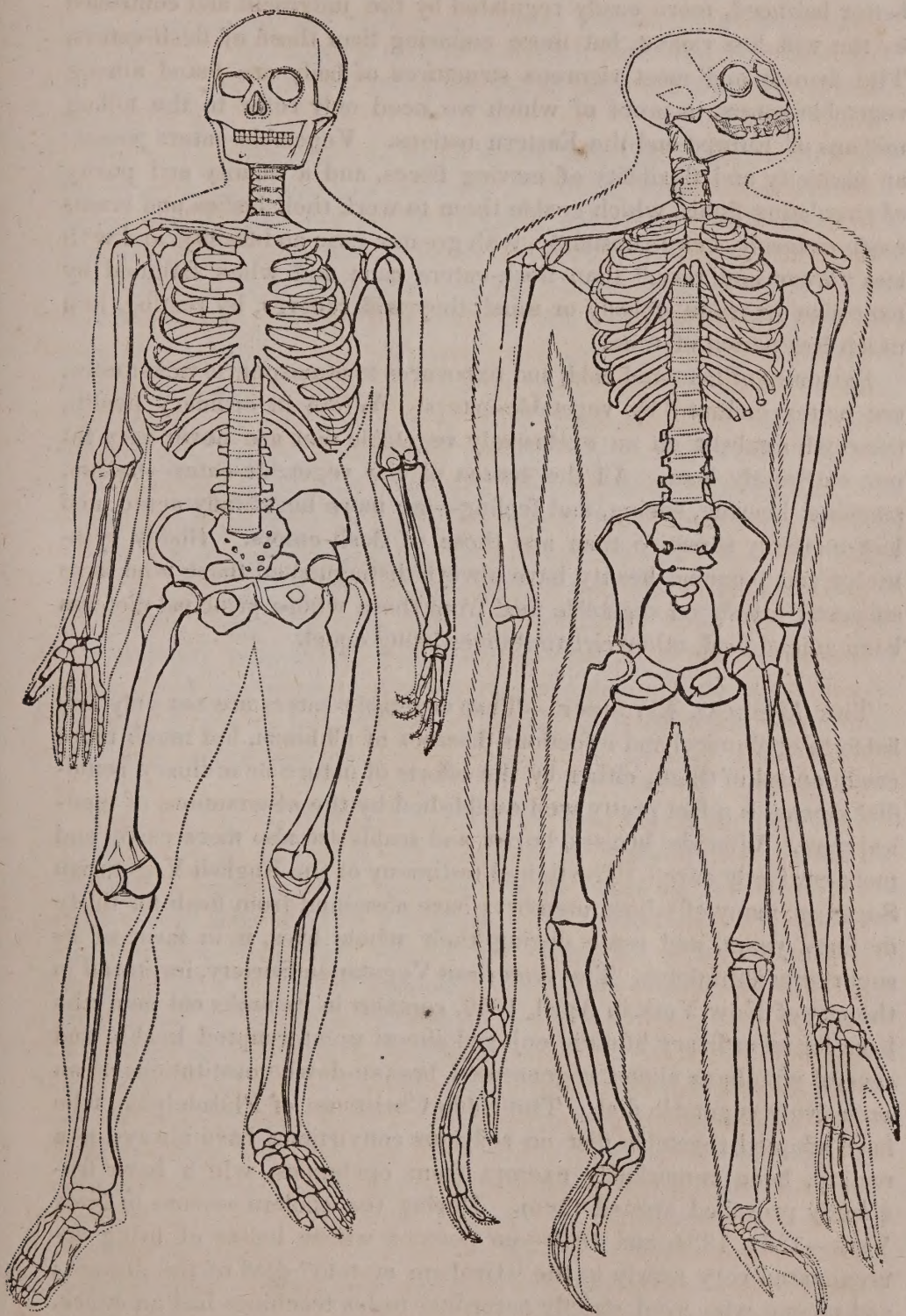
The human masticatory organs, on the whole, exhibit no evidence of any structural arrangement which is not precisely fitted for and exclusively adapted to a vegetable diet. The human teeth can, however, cut and tear flesh to some extent; and so can carnivorous animals break and mash fruits and seeds to some extent. Experiments have also proved that each class of animals may be made to approximate the other, to some extent, in character and disposition, by changing their dietetic habits. Young tigers and young lions have been restricted to vegetable food, during which time they remained docile and governable; but on tasting raw meat, the dormant propensity to tear the warm, quivering flesh, and drink the red blood of other animals, was immediately aroused, and all the ferocity and cruelty of a carnivorous nature was again in the ascendant.

"Just as the twig is bent the tree is inclined," physiologically as well as morally. Those mothers who *force* their little children, even before they are capable of masticating a particle of it, to swallow flesh, and thus develop an early appetite for it, are little aware how seriously they are injuring the organizations and corrupting the whole nature of the future men and women.

Lastly, we have, in Fig. 161, a view of the entire skeleton of man compared with that of a purely frugivorous animal. Not only is the agreement perfect with respect to the masticatory organs, but the whole digestive apparatuses of both are precisely alike; and even the entire conformation of the body of the orang-outang, considered dietetically or physiologically, resembles the human animal, incomparably more nearly than any other animal does. How, then, can we draw from the structure of man, as compared with other animals, any inferences at war with the divine commandment recorded in the Scriptures?

THE PHYSIOLOGICAL EVIDENCE.—Physiologists have noticed that the blood of flesh-eating animals undergoes putrefaction much sooner than that of a vegetable-eating animal. The chyle of flesh-eating men, when taken out of the body, decomposes and becomes putrescent in less than a quarter of the time required for that of the vegetarian to undergo the same process. All the secretions of vegetarians are more pure, bland, and copious, and the excretions—the sweat, urine, fecal matters, etc.—are less offensive to the senses, and less injurious in their exhalations, than are those of persons who subsist on a mixed diet. The teeth of vegetarians are less affected with tartarous incrustations, and their breath is mostly or entirely free from the rank, cadaverous, pestilent odor so common to flesh-eaters. Medical authorities generally agree that flesh diet makes the blood *prone*, and the whole body disposed to, the inflammatory and putrid diatheses. Some few medical writers have, however, *asserted* that an exclusively vegetable diet predisposes to *scurvy*; but as they have not sustained the assertion with any sort of evidence, it is hardly worth refuting. The vegetarian can always endure hunger and thirst longer without loss of strength, and sustain entire privation of food with much less suffering than flesh-eaters. The appetite of vegetable-eaters is invariably good and food has always a keen relish, while it often fails with flesh-eaters requiring frequent changes of dishes, or a variety of seasonings, to render it palatable. Digestion with the vegetarian is unattended with that disturbance, heat, irritation, oppression of the stomach, and dullness or drowsiness of the head, which flesh-eaters generally experience after dinner, and which some physiologists, on the mistake supposition that it was natural, have called the "fever of digestion. Drowsiness, sleepiness, and mental stupidity, so common after a full meal with flesh-eaters, are wholly unknown to vegetarians, when their other habits are correct. These can resume any bodily or mental labor immediately after a meal, with incomparably less discomfort, and greater immunity from evil consequences, than can flesh-eaters.

Fig. 161.



THE HUMAN SKELETON COMPARED WITH THAT OF THE ORANG-OUTANG

All the mental passions of the vegetarian are more governable and better balanced, more easily regulated by the judgment and controlled by the will, less violent, but more enduring than those of flesh-eaters. The firmest and most vigorous structures of body are found among vegetable-eaters, in proof of which we need only refer to the toiling millions of Europe and the Eastern nations. Vegetable-eaters possess an elasticity and flexibility of moving fibres, and a tenuity and purity of circulating fluids, which enable them to work their bodies and brains more severely, more constantly, with greater ease and facility, and with less "wear and tear," than flesh-eaters can; and when fatigued by excessive exertion of body or mind, they will recover, by resting, in a much less period of time.

Extremes of heat and cold, and exposures to atmospheric vicissitudes, are better endured by vegetable-eaters. When in ordinary health, those who subsist on an exclusively vegetable diet are never very fat nor extremely lean. All the senses of the vegetable-eater—tasting, smelling, hearing, seeing, and feeling—are more healthfully acute, and less morbidly sensitive than are those of flesh-eaters. Bodily symmetry and personal beauty have always distinguished those who have subsisted mainly on vegetable food from those whose principal diet has been animal food, other circumstances being equal.

The Medical Evidence.—That vegetable-eaters are not only less liable to epidemical and infectious diseases of all kinds, but much more easily cured of them, either by the efforts of nature or ordinary remedial means, is a fact pretty well established by the observations of medical men. Wounds, bruises, burns, and scalds are also more easily and more perfectly cured. The united testimony of the English Vegetarian Societies, many of whose members have abstained from flesh for thirty or forty years, and some during their whole lives, is in favor of its superior healthfulness. The American Vegetarian Society, instituted in the city of New York in April, 1850, contains in its ranks old men who have for an ordinary lifetime enjoyed almost uninterrupted health, and several who have almost regenerated broken-down constitutions on an exclusively vegetable diet. The Bible Christians, of Philadelphia, who have adopted vegetable diet on religious convictions, have always, as a society, been remarkably exempt from epidemics, which have frequently prevailed around them. During the cholera seasons in New York—1832, 1834, and 1849—no persons whose habits of living approximated very nearly to the "Graham system" died of the disease; and no one who lived strictly according to his teachings had an attack. Missionaries and teachers have, within a few years, gone from the

United States to the sickly parts of Africa, and, by adopting an exclusively vegetable diet, escaped all the attacks of disease which others have experienced, and which are usually considered as incidental to the climate. The same is true of Northern men who, in removing to or traveling through the Southern states, have adopted the vegetable system of diet.

But more striking and, to many minds, more convincing evidence, is furnished in the numerous examples of chronic diseases and malignant ulcers, which have resisted all remedial agencies under a mixed diet, yet have been readily healed under a vegetable regimen. Dr. Lambe succeeded, in cases of cancer, scrofula, consumption, and other maladies which had progressed to the incurable stage, in arresting the ravages of the diseases, and protracting the period of life for many years, by a strict vegetable regimen, and the use of distilled water for drink. The celebrated Dr. Twichell, of New England, has recently cured himself of a malignant tumor of the eye, which has troubled him for ten years, and which had been once excised and once cauterized, with but temporary benefit, by adopting a diet of bread and cream. I have now a patient under treatment for a tubercular affection of the lungs, who, two years ago, was afflicted with a foul and malignant ulcer of the cheek, deeply involving the upper maxillary bone. After trying the ordinary medication in vain, and submitting to the operations of cutting and cauterization without avail, the patient, against the remonstrances of friends and physicians, abandoned flesh-eating, after which the ulcer healed rapidly.

The Chemical Evidence.—All the light which chemistry is able to throw on the subject of diet is in favor of vegetable food exclusively. Nothing is more common than for medical books and writers to tell us that animal food is more *nutritious*, more *concentrated*, and more *digestible* than vegetable. But these terms are generally employed without any very precise meaning. The truth is, some kinds of vegetable food, as the cereal grains, are more nutritive, pound for pound, than any kind of animal substance; other kinds, as fruits and most esculent roots, are less nutritive. The term concentration has scarcely any meaning applied to animal food, for although some kinds of animal food are more nutritive than others, there is, except in the separation of the curdy and oily matters of milk from the watery part, no method known of separating the nutritious from the innutritious element; and such an invention, should it ever be produced, would tend powerfully to bring animal food into disuse. Some vegetables, and some kinds of fruit, digest, or rather *dissolve* in the stomach sooner than some kinds

of animal food, but not as rapidly as other kinds; but the length of time necessary for the digestion of an article of food proves nothing for or against it.

If we determine the value of foods strictly by the rule of chemical analysis, according to the Liebig school, we shall find that good wheaten bread, rice, and lentils, contain four times as much nutritive virtue as the best flesh-meat, while potatoes contain at least an equal amount. If we admit Liebig's theory of the combustion of carbon to sustain the animal temperature, we shall find abundance of carbon, *and the best kind of carbon*, in vegetable food. And if we accede to the doctrine of the *nitrogenous* and *non-nitrogenous* distinctions of alimentary principles, we find nitrogen supplied in nearly all kinds of vegetation, and an inexhaustible resource, in case of accidental scarcity in the vegetable kingdom, in the atmosphere which surrounds us.

The Experimental Evidence.—We have no account that Adam and Eve ever departed from the commandment of God in their dietetic habits, and in the absence of all evidence to the contrary, we are bound to believe they were consistent vegetarians. Although the children of men went astray in an early period of the world's history, "by dipping their tongues in gore," and a large proportion of the human family has continued in the trangression ever since, yet there have been, at all times, men of superior intelligence and high-toned morality, who have rigidly abstained from flesh-eating. Among them we find poets, philosophers, and prophets, distinguished alike for "temperance in all things," purity of life, rectitude of deportment, and length of years.

Pythagoras raised up a society of vegetarians 550 years before Christ. Josephus testifies that the Essenes, a sect of the ancient Jews, numbering several thousands, were long-lived because of their regular course of life and simplicity of diet, which Pliny tells us consisted of the fruit of the palm-tree. It is certain, however, that they were vegetarians after the Pythagorean philosophy. The Bramin priests, who are a very numerous sect, are all strict vegetarians. Sanchoniathan, a Phœnician historian, Hesiod, the Greek poet, Pythagoras, the philosopher, Herodotus, a celebrated ancient historian, Hippocrates, the father of medicine, Diodorus Sicculus, the historian, Ovid, the poet, Ætianus, a Greek historian, and Pliny, the Roman naturalist, all testify that the primitive inhabitants of the earth subsisted on a vegetable diet alone.

Pliny, Plutarch, Galen, and Porphyry, testify to the good effects of vegetable diet in developing bodily vigor, and enabling men to bear hunger, thirst, heat, or cold.

Among the modern names of distinguished individuals who have borne testimony in favor of vegetable diet as conducive to the highest physiological and psychological interests of man, derived from observation, reflection, and in most instances from personal experience, we may notice the celebrated Dr. Cheyne, of England; Sir John Sinclair, an eminent British surgeon; Dr. Cullen, of Edinburg; Dr. R. Jackson and Gen. Elliot, of the British army; Sir William Temple; Professor Adam Ferguson; Rosseau; Newton; Dr. Whitlaw; Lord Bacon; Sir Richard Phillips; Howard, the philanthropist; Dr. Hufeland; Peter Gassendi, a famous French philosopher; Dr. Taylor; Dr. Abernethy; Lord Kaims; Professor Dick; Shelley, the poet; Mr. Shillitoe; Rev. John Wesley; Lamartine; the Abbe Gallani; Benjamin Franklin; Dr. Muzzey, of Cincinnati; Dr. Jennings, of Oberlin; "Father Sewall, of Maine; Dr. S. Graham, of Northampton; Dr. Alcott, of West Newtown; Rev. William Metcalf, of Philadelphia; Dr. James, of Wisconsin; Dr. Grindrod, author of Bacchus; O. S. Fowler, the phrenologist; and a host of others who could be named.

But all human experience, rightly apprehended, is in favor of vegetarianism. It is a fact which no intelligent historian will dispute, that the most robust and enduring laborers of all ages and countries ever have been, and still are, in the main, vegetable-eaters. The peasantry of England, Scotland, Ireland, Italy, Turkey, Greece, Germany, Switzerland, France, Spain, Portugal, Norway, Sweden, Denmark, Poland, and many parts of Russia, subsist principally, and many of them entirely, on vegetable food; and the finest specimens of health, strength, and activity are found among that portion of the peasantry of several of the above countries, who use no animal food at all. The greater portion of the inhabitants of Asia and Africa use but an insignificant trifle of animal food. The millions of Hindostan and China use so little animal food that it may be regarded as a seasoning rather than a substantial part of their diet. The Greek and Russian laborers, and the lazzaroni of Naples, subsist on a diet principally of coarse, farinaceous food, and they are as athletic and powerful a race as can be found. The Irish immigrants, whose brawny arms and powerful sinews perform the hard work of excavating our canals and constructing our railroads, which our flesh-bred American laborers have not strength to do, have generally acquired good, vigorous constitutions on the coarse, vegetable, potato diet of the old country. The Georgians and Circassians, the natives of the Otaheite, Sandwich, and Pitcairn's Islands, the people of the Marquesas and Washington Islands, the Indians of Mexico, on the Tobasco, the Polish and Hungarian peasants from the Carpathian Mountains, the Spaniards of Rio Salado, in South

America, and the Peruvians, subsist mostly on coarse, plain, vegetable food, and they are among the most beautiful as well as the most hardy and enduring people on earth. The slaves of Brazil, the laborers of Laguira, the Moorish porters at Gibraltar, and the porters at Terceria and Smyrna, subsist on a spare, simple, vegetable diet, scarcely ever partaking of animal food; they possess a most powerful muscular development, and are able to carry burdens of from two hundred to eight hundred pounds.

A glance at those nations and tribes whose inhabitants subsist mostly on animal food, will set the argument in a stronger light by the contrast. The Laplanders, Ostiacs, Samoides, Tungooses, Burats, Kamtschatdales, and Esquimaux, in the north of Europe, Asia, and America; the inhabitants of Terra del Fuego, in Southern America; the people of Andeman's Island in the Pacific, the natives of New Holland and Van Diemen's Land, and the Calmuck Tartars, all possess a low, deformed, and demi-brutal organization; some of them are stunted and dwarfish, others are coarse, rough, and hideous. Their principal food is fish, flesh, and all kinds of animal fats and oils which they are able to procure. It should be remarked, too, that the intellectual and moral constitution of these inferior races of men is as degraded and depraved as is their bodily organization.

But it will be readily admitted by most persons that a diet nearly all vegetable is better than a diet nearly all animal, while they will contend that a due admixture of animal and vegetable substances is the golden mean between the two extremes; and in support of this position we shall be referred to the well-fed of the Anglo-Saxon race, and particularly the better classes of Europe and America. But this objection is easily met. We have but to compare flesh-eating Englishmen, Irishmen, Scotchmen, Americans, etc., with vegetable-eating Englishmen, Irishmen, Scotchmen, Americans, etc., of the same class, and of the same general habits in other respects, and the problem is solved. The contrast ever has been, and I am fully persuaded ever will be, in favor of the superiority of an exclusively vegetable diet.

If, however, the past experience of the whole human family for six thousand years, and the coincident testimony of all respectable scientific authors who have ever investigated the subject is not satisfactory, we can furnish living, acting, moving, practicing demonstrations in the present tense. James Simpson, Esq., president of the English Vegetarian Society, stated at a public meeting held at Glasgow, June 17, 1851, that of the individuals belonging to the society, numbering between 600 and 700 adult members, 203 have abstained from all kinds of flesh for upward of ten years 153 for more than twenty years

91 for thirty years; 29 for forty years; and 85 have abstained the whole of their lives. These vegetarians belong indiscriminately to all trades and professions, and have, as a body, always a much higher and more uniform standard of health than flesh-eaters under similar general circumstances, and many of them have experienced a wonderful improvement in bodily vigor and mental vivacity.

But we have equally interesting facts in the United States. The American Vegetarian Society, though of more recent date and fewer numbers, has in its ranks full-grown men and women who have never tasted "flesh, fish, or fowl." Rev. Mr. Metcalfe, who is the corresponding secretary of the society, and also pastor of the Society of Bible Christians, who have adopted vegetarianism from religious motives, has practiced the vegetarian system for more than forty-one years, as has also his wife. In a late number of the Vegetarian Advocate he says: "We have raised a family of five children, none of whom have ever eaten flesh. They are all married to vegetarians; they all have children, none of whom have ever used animal food; they are healthy, vigorous, and intellectual." In this society there are now fifty-one persons who have never eaten flesh, nor tasted intoxicating drinks.

CHAPTER II.

HYDROPATHIC COOKERY.

Practical Considerations.—Though I am most thoroughly convinced of the superiority of a properly-regulated vegetable over the best plan of a mixed diet, yet I am equally well aware of the many difficulties in the way of the practical application of this truth. The greatest difficulty of all is the fact that any considerable change of dietetic habits, whether it be to better or worse, usually produces more or less disturbance of the digestive apparatus; and if the change be from a more concentrated and stimulating to a more simple, coarse, watery, and unirritating diet, the change will be attended with a degree of languor, depression, and sense of debility, proportioned very nearly to the extent that the individual has been injured by stimulation and concentration. This is an exceedingly important principle in hydrotherapeutics, as well as the most difficult point to manage successfully in the whole Water-Cure system; hence it ought to be well understood by both practitioner and patient.

It may be stated as a general rule, that *the greater the necessity for a change of dietetic habits, the more will the individual suffer temporarily in making such change;* the worse the physiological condition produced by dietetic errors, the more will the feelings rebel against a removal of the cause. This perverted sensibility is the rock on which so many have been wrecked in their attempts to reform their dietetic habits. Reason points in one direction, but feeling impels another way, and usually the latter triumphs.

All persons know *how* they feel; but all do not apprehend the true sources of their good or bad feelings, and the majority mistake the sense of mere stimulation for the condition of actual strength; they do not distinguish between the feeling of strength and vital power; they do not consider that strength or power is only shown in its waste or expenditure, not in its accumulation or possession. To illustrate: A man who has long been accustomed to the habitual use of intoxicating liquor of any kind, will experience a great degree of prostration, sometimes amounting to *delirium tremens*, on abstaining from it. The apparent exhaustion will be in the exact ratio that his system has been morbidly affected by the alcohol. The habitual tobacco-chewer, on abandoning the use of that narcotic, feels himself to be but the wreck of a man; his limbs tremble, his brain reels, and "horrors on horror's head accumulate." His perverted instincts cry out, as it were, for more tobacco, and his *feelings* tell him that the weed is the true "elixir of life," and if he takes another quid he is at once happy within himself, and at peace with all the world again. Those who have stimulated freely on tea and coffee will often suffer intense headache, giddiness, and nervous debility for several days, sometimes for weeks, on discontinuing them, before the system will recover its normal balance, and feel *natural* without artificial aid. Here we discover the law of conformity. The human organism has a wide range of adaptability; it conforms itself as well as possible to every thing brought in contact with or forced upon it. This principle of adaptability is essential to its existence; for if every succeeding dose of spirituous liquor, tobacco, tea, coffee, or other injurious agent, produced an effect equal to the first, the body would very soon be destroyed. The vital powers may have the ability to defend themselves against deleterious stimulants for half a century, more or less, and have natural ability to sustain existence two or three times as long, if not wasted in this unnatural warfare. Let us apply these considerations to the employment of food.

A person long accustomed to the use of animal food two or three times a day or of several kinds at a meal, will feel usually a great sense of weakness, or rather a disagreeable craving and want of satis-

faction, in the region of the stomach, on the adoption of an exclusive vegetable diet; so, too, one accustomed to the employment of nearly all concentrated preparations, as fine or superfine flour, for the farinaceous part of his diet, will find the first employment of coarse, unbolted meal, and many kinds of watery vegetables and fruits, attended with unpleasant distension of the stomach, flatulence, acidity, etc., also, those accustomed to stimulating condiments, as pepper and mustard, generally find nearly all sorts of food to feel heavy and sit uneasily on the stomach, on first adopting plain, unseasoned dishes; and even many persons who have used animal food very moderately once a day, experience considerable disquietude in the digestive organs, with a constant craving for some kind of stimulus, on totally abandoning flesh-meat; and this craving may re-occur occasionally for months.

Now if all persons were to follow their feelings as the proper dietetic guide, all persons would forever continue on in whatever dietetic system should once become with them an established habit. It is clear, therefore, that in prescribing a dietetic course for invalids, our reason, and not their feelings, is the better guide. Our aim is not to pamper morbid, but to restore healthy appetites. I have had many patients under treatment whose first meal of wheaten grits and milk, or brown bread and baked apples, raised a tremendous commotion in the stomach, producing distension, nausea, and headache; and yet in a few days the same persons would partake of them with a keen relish, and with perfect satisfaction to the stomach.

But in laboring to introduce better habits of living, and in dealing with invalids, we must take mankind in general, and patients in particular, as we find them, not as we would have them; and in advising a particular course of diet, or in recommending changes in the accustomed regimen of individuals, we must, to be useful, have regard to what is possible in practice, as well as to what is true in theory. Our advice is sought by thousands who have not the means to carry out a well-regulated plan of vegetable diet; and a well-regulated mixed diet is far preferable, therapeutically, to a very bad selection of vegetable food. At ordinary hotels and boarding-houses, the fruits and vegetables are not selected with especial reference to their dietetic qualities, and their attractiveness depends much more on the butter, sugar, vinegar, or spices, with which they are served, than upon their own intrinsic gustatory properties, while nearly all the farinaceous parts of the food are brought from the baker's shop, or prepared according to the recipes of "French" and "domestic" cook-books, which teach little else than the art of compounding dishes so as to produce the greatest possible amount of disease in the human body. Here, then, is a predicament.

Many persons find it convenient or necessary to take their meals at these hotels and boarding-houses, where animal food constitutes the best articles of the table. Plain flesh-meat is not liable to the objection of concentration or complication, and if of good quality it contains the proper relations of bulk and nutriment. All the objections to animal food may be summed up in a single word—*impurity;* yet if it be of the best quality and properly cooked, it is an absolute advantage, a corrective to a diet consisting mainly of baker's bread and sweet cakes.

How far, therefore, it is expedient for a Water-Cure patient, who intends remaining at an establishment a few weeks, and then returning to his former boarding place, or usual dietetic habits, to adopt vegetarianism, must be left to the intelligent physician, in view of all the circumstances of each particular case. It is very certain that many patients require, for successful treatment, total abstinence from all animal food, not even excepting milk, and that the majority will obtain more speedy and thorough cures under a well-regulated vegetable diet; yet it is equally certain that a large proportion of invalids can be cured, and can subsequently enjoy, comparatively speaking, very good health, on a plain mixed diet. But the duty of the true hydropath is not limited to being a mere curer of disease. His is a higher, nobler mission. He is, or should be, a reformer in the broadest sense. It may do for the drug-tinkerer who only studies the philosophy of death, who contemplates the machinery of life only in its abnormal manifestations, whose ambition is mainly to silence, scatter, subdue, change, or otherwise modify the phenomena of morbid symptoms, and who is as profoundly ignorant of the philosophy of life as of any other subject he has never studied—it may do for him to medicate the existing maladies of mortals with all his might, while he leaves the causes in operation which produce other maladies as fast as he can modify existing ones. But better things are expected of a hydropathic physician, who claims a knowledge of the laws of life and health, and professes to cure disease by removing the conditions upon which it depends, and preserve health by avoiding the causes which produce disease.

While, therefore, we yield to circumstances we cannot control, until society can be more thoroughly indoctrinated in the true science of life, we should make the best we can of unavoidable evils. We can and should at once reject all the immense variety of complicated dishes of animal food, all unclean and filthy animals, and all the unclean and unwholesome parts of animals, confining our dietetic prescriptions to a few of the very best articles and preparations. That patient or that individual whose appetite cannot be satisfied, as far as flesh, fish, and fowl are concerned on seven dishes per week, with a change for every

day in the week, furnishes an example of a deeply-depraved appetite, and an additional evidence, if any is wanted, that all flesh-eating is a departure from the physiological laws which the Creator has implanted in the constitution of man.

Preparations of Animal Food.—Consistently with the principles advocated in this work, all animal broths, soups, teas, all pickled, salted, and smoked meats, all kinds of shell-fish, all fried dishes, all dishes cooked in butter or other grease, all minced or other meat pies, all very oily or greasy animals or parts of animals, all and every thing pertaining to the swine—pork, bacon, lard, sausages, etc., and all very young or very old animals, are to be considered as among the things prohibited.

Beef-steak, cut from the sirloin, well-pounded and broiled, is probably the very best food that can be obtained from domesticated animals. The pieces called "porter-house steaks" are more tender, but too fatty.

Mutton chops, prepared in the same way, are next in the order of preference. For those who have feeble teeth they are better stewed in water until they are very tender. These chops should be well cleaned of the fatty matters.

Boiled mutton is nearly equal to the former in healthfulness; the leg is the preferable part.

Slightly corned beef, boiled till the fibres cut easily, is admissible. The lean pieces are to be selected; the rump piece, or round, is one of the best.

Roast beef is also an admissible article. The sirloin piece is, on all accounts, to be selected for roasting. As the roasting process of cooking renders the fatty matter particularly obnoxious, this should be carefully trimmed off before cooking.

Beef hash, made by chopping cold corned beef or beef-steak fine, and warming it up with three or four times the quantity of cold boiled potatoes and water, no butter or grease being employed, is not objectionable. The flesh of some wild animals of the herbivorous kind is at least as healthful as that of any domestic animals, as the deer, hare, rabbit, etc., and may be prepared and employed under the same regulations.

White fish, which are not oily nor strong, broiled or boiled, may be occasionally substituted for flesh. The cod, halibut, trout, black-fish, white-fish, and perch, are among the best. Eels, salmon, mackerel, herrings, shad, sprats, etc., are among the greasy varieties. Fish are more dry and unsavory than flesh without gravies. If a gravy is em-

ployed, it should be made of water, milk, a little salt, and thickened with a little flour or meal.

The *barn-yard fowl* is the best kind of domestic poultry. The turkey does not differ much in wholesomeness from the common chicken, yet its flesh is not as well relished without gravies or seasonings. Geese and ducks should be ruled away from the table. Chickens may be broiled, boiled, or stewed in water with equal advantage, taking care to skim off the floating particles of oil when cooked in either of the last two methods.

Eggs, rare-boiled, are admissible occasionally. They should always be very fresh, and cooked by standing seven minutes in water, which is to be poured upon them at the boiling point, but not allowed to boil afterward. This method deprives them of the raw taste, and yet leaves both the white and yolk soft and digestible. Poached eggs, omelettes, etc., are outrages upon human stomachs.

Here we have a list of the best or least objectionable kinds of animal food, which can be so managed, if desirable, that the same article need not occur but once in two weeks; and surely the appetite that cannot be satisfied on this extent of variety, would still want something more if it had all the beasts of the field, and fishes of the sea, and birds of the air, spread out before it. But the true policy of a dietary system, as far as relates to animal food, is to simplify as much as possible, and to employ as few kinds as may be; therefore the very best articles in our list—beef and mutton—ought to come upon the table much oftener than fish and fowl.

Milk, when employed at all, should always be used moderately by invalids, rather as a seasoning than a part of the food. Very little should be taken at the evening meal, as it is apt to irritate the kidneys, or produce restlessness and uneasy sleep, with feverishness, and dryness or bad taste in the mouth. Sour milk, whey, or buttermilk, are no better in any case than pure water; but many persons are fond of them, and I regard them as entirely harmless. *Boiled milk* is regarded by some as more suitable for dyspeptics. No doubt it will feel more agreeable in cases wherein raw milk produces flatulence; but it is constipating, and in such cases milk had better be avoided entirely.

Pot cheese, *fresh curd*, and very *new pressed cheese* are not objectionable when used moderately as relishes. The former article should never be made in the common brown earthen vessels, as the lead employed in glazing them is acted on by the acid of the milk, and a poisonous salt of the metal produced. Several cases of poisoning from this cause have been lately reported in the newspapers.

Butter should always be as fresh as possible, but moderately

salted, and eaten cold. Dr. Johnson *(Domestic Hydropathy)* gives us an excellent rule in relation to bread and butter. He says: "For breakfast and supper there is nothing better than bread and butter *But the butter should be as small as possible in quantity.*"

Preparations of Vegetable Foods.—Vegetarians can prepare an unlimited variety of dishes, and still preserve the characters of simplicity and healthfulness. All pure and undepraved appetences, however, are satisfied with moderation in variety as well as in quantity. Invalids should not study so much to ascertain how many kinds of food they can bear, as to learn what particular combination of articles is most conducive to the recovery of health. But we can easily present an ample variety, so that all can select according to taste, fancy, or convenience, or in reference to personal peculiarities. This part of our subject may be conveniently arranged under the following heads:

a. Breads.—Unquestionably the best bread is that made of coarse-ground, unbolted meal, mixed with pure water, and baked in any convenient way. The earliest bread-makers pounded the grain on a smooth stone or in a mortar, wet it with water, and baked it before the fire or in the ashes. Various savage tribes have made corn-bread in a similar manner, and all who have partaken of it testify to its delicious flavor and excellent quality. The inhabitants of new countries, where flouring-mills are not to be found, frequently resort to this method of bread-making from necessity, and they have a sweet and wholesome article when they do not spoil it with grease, or shortening. Many of the New England housewifes formerly had a method of making bread without raising or fermentation of any kind, and I believe it is still practiced to some extent. It is made generally of a mixture of wheaten and rye flours and Indian meal. Wheat-meal, with a small proportion of Indian, makes a fine unleavened bread. It may, however, be made of wheat-meal alone, or of rye and Indian, or of various other admixtures. Fine wheaten flour alone will not make good bread in this way. Of whatever meal or flour composed, it is to be wet up with water or milk, or both, into a moderately stiff dough, and baked in the old-fashioned iron baking-kettle for several hours. The New England custom was to make the bread in the evening, put it in the kettle, cover it sufficiently with hot ashes and coals, and let it remain until morning, when as good, sweet, and wholesome bread as mortal ever tasted, would be found on the breakfast table.

For making *unleavened* bread, the grain should be thoroughly cleaned, all foreign ingredients removed, the husks of oats and buckwheat and the hulls of corn carefully separated. If ground at an

ordinary flouring-mill, the mill-stones should be sharp, so as to cut the seeds into fine particles. If mashed by dull stones, the bran appears in flakes or scales. The meal should never be bolted. Great pains should be taken to procure a plump, sound article of grain, and families would do well to keep a hand-mill, and grind it for themselves, as all kinds of flour and meal are much better and sweeter fresh-ground than when kept a long time. A large coffee-mill will answer very well, although it usually makes the meal rather too coarse and uneven.

Wheat-meal makes the very best unleavened bread. New meal is to be wet with *pure soft* water—it is important that the water be *pure;* then formed into very thin cakes, and well baked in an oven, stove, reflector, or before the fire on a plate or board. Indian meal, managed in the same manner, makes an excellent bread. It may be made thicker than the wheat-meal cakes. It is called in this country, *Johnny-cake*, or *hoe-cake*. The fine Indian meal often found at groceries and provision stores, does not make good bread or cake; it is, when cooked, heavy, sticky, and clammy, whereas the coarse is light, dry, and porous. Oatmeal may be prepared in the same way; it is more pleasant made into extremely thin cakes, or wafers. Rye, buckwheat, millet, and barley may be formed into similar preparations of bread; but they are less agreeable, and, as the other grains are more plentiful and more economical, as well as more pleasant, it is hardly worth while to extend this list. In making any of the above breads, cold or warm water may be employed; some prefer scalding the meal.

The most common as well as the best kinds of unleavened bread made from mixtures of various coarse meals are: 1. Wheat and Indian meals in equal proportions. 2. Two parts of wheat-meal to one of Indian. 3. Three parts of wheat-meal to one of Indian. 4. Four parts of wheat-meal to one of Indian. 5. Equal parts of wheat-meal and oatmeal. 6. Six parts of wheat-meal to one part of soft-boiled rice. 7. Equal parts of rye and Indian meals. 8. Equal parts of rye, Indian and wheat-meals. 9. Two parts of rye-meal to one of Indian. 10. Two parts of Indian to one of rye-meal. 11. Two parts of Indian meal to one of rye-flour.

Very good and wholesome breads can also be made of wheat or other meal, and the addition of some one of a variety of vegetables and fruits. Among the best are: 1. Three parts of wheat-meal to one of soft-boiled beans. 2. Three pounds of wheat-meal to one pound of good mealy potatoes. 3. Seven pounds of wheat-meal to two of soft-boiled split peas. 4. Three or four parts of wheat-meal to one of soft-boiled chestnuts. 5. Two or three parts of wheat-meal to one part of good sweet or moderately tart apples, pared, cored, and stewed or

baked. 6. Three or four parts wheat-meal to one of West India pumpkin, or marrow squash, or cream squash. A fair article of bread can also be made of three parts of wheat, corn, or barley-meal, to one of powdered comfrey root; also of three parts of wheat-meal to one of boiled and pounded green corn.

I am satisfied that if our good mothers and intelligent sisters would give their attention less to mixed meat dishes and cake compounding and more to bread-making, they would improve very much on all the methods of preparing bread-food now in use. For one I am greatly in favor of the combination of meal with roots and fruits; and the few experiments I have been enabled to make in this line have satisfied me that most delicious bread, and more advantageous, considered in reference to the usual dietetic habits of society, than even the best wheat-meal bread, can be made of wheat-meal and good mealy Irish potatoes, or sweet potatoes, or good mealy apples and pears, and probably a variety of other fruits and vegetables; nor can I see any reason why dried or preserved fruits can not be advantageously employed in this way, although I have never seen the experiment tried. I know it may be replied to this, that people may as well eat the clear meal-bread, and a due supply of the less nutritious fruits or vegetables with it. So they may. But if they *will not*, and *will* use the proper proportions of each when compounded into the shape of bread, they had better have the bread. This kind of bread would also be a great convenience, to say the least, to persons who are obliged to travel much, and who desire to "eat to live" while on a journey as well as when at home.

Fermented breads may be made of any or of all the articles or combinations mentioned above. But wheat, from its larger proportion of gluten, is greatly superior to all other grains for making fermented bread. The best *ferment* is good hop yeast or potato yeast. Milk yeast makes a very good bread, but it will not keep well. Distillery yeast, though much used in cities where distilleries and breweries are common, never makes good, sweet bread, but always imparts to it a strong, disagreeable, musty flavor. There are several ways of making good yeast, either of which may be employed, as most convenient. I know no better recipe for *hop yeast* than the following, copied from Graham's Science of Human Life: "Boil a double handful of hops in a gallon of water for fifteen or twenty minutes; strain off the liquor while scalding hot; stir in wheat-meal or flour till a thick batter is formed; let it stand till it becomes about blood-warm, then add a pint of good, lively, fresh yeast, and stir it well, and then let it stand in a place where it will keep at the temperature of about 70° Fah., till it

becomes perfectly light." This yeast will keep from one to two weeks, if corked tight in a clean jug, and placed in a cool cellar.

Yeast cakes, which may be kept for weeks or months, are made by stirring good light yeast into Indian meal, until a fine dough is formed, which is to be made into thin cakes and perfectly dried. It is best when dried by exposure to a warm dry current of air, or what is called a drying wind. Sunlight or fire seems to impair its properties. Some persons add a little rye meal to make the Indian more adhesive. These cakes, which are commonly called *hard yeast*, require to be kept in a cool and dry atmosphere. One of these cakes, an inch thick, two inches wide, and three inches long, is sufficient for four quarts of flour or meal. They are soaked in milk or water until completely dissolved, and then employed like other yeast.

Hard flour yeast, or *rubs*, is preferred by some to the former preparation. It is made by mixing the yeast with wheat-meal or flour so that it will be formed into hard lumps; it is then dried in a warm place, without exposure to the sun. The finer particles are for immediate use, and the larger lumps may be put into a bag, and hung in a dry, cool place. In using these "rubs," about a pint are necessary for six quarts of flour. It is usual to let them soak from noon till night, on the day preceding that for wetting up the bread.

Some persons may desire to know how to make yeast without yeast, in other words, how to procure the *original ferment*. It may be obtained by subjecting any kind of meal or flour to fermentation. Wheaten flour or meal is generally employed. Mix the meal or flour with water or milk into a batter or dough, and let the preparation stand exposed to a temperature of about summer heat—60° to 70° Fah., until it "raises" or ferments; it will then communicate the fermenting property to any other material capable of undergoing a similar process. The ferment can be created more rapidly by the addition of mashed potatoes and molasses.

Potato yeast is a favorite with some domestic bread-makers, and it is certain that excellent bread can be made with it. It will not keep as long as the hop yeast, but it has the advantages of rising quicker, and of not imparting the sharp, harsh taste to bread that the former does, when not carefully managed. Miss Beecher *(Domestic Receipt Book)* gives a good recipe, with the exception of the distillery yeast, which I have substituted by baker's yeast. I have also omitted the salt, which appears to be a kind of *fixture* in every preparation or thing mentioned in her book: "Mash half a dozen peeled boiled potatoes, and mix in a handful of wheaten flour [or meal], and after putting it through a

colander, add hot water till it is a batter. When blood-warm, put in a tea-cup of baker's yeast. When raised, keep it corked tight."

Milk yeast, or *risings*, is made by mixing two table-spoonfuls of flour or meal with a quart of new milk, and keeping the preparation at about or a little below blood-heat for an hour or two. It requires nearly twice as much of this as of the ordinary hop yeast for a loaf of bread. For those who are fond of milk, this yeast makes an agreeable bread, to be eaten the next day after being made. In warm weather it soon spoils.

All bread-makers ought to be thoroughly acquainted with the *theory of fermentation;* although many persons acquire, by practice and observation, the tact of managing the fermenting process very well, a knowledge of its theory would enable all to succeed more uniformly, as well as qualify them to detect the errors and correct the mistakes of others. *Panary fermentation*, or, which is the same thing, *vinous fermentation*, is the decomposition of the sugar or saccharine matter of the grain, and the recombination of its elements so as to produce carbonic acid gas and alcohol. The alcohol is mostly dissipated by the heat of the oven, the remainder evaporating subsequently, and the carbonic acid gas, being retained by the tenacious gluten, puffs up or raises the dough. If the yeast is not intimately mixed with every particle of the meal or flour by thorough kneading, the fermentation will be unequal, and some portions of the bread will be compact and heavy, while others are marked with open cavities. If the dough is well kneaded, yet not allowed to raise sufficiently, it will be heavy, raw, and clammy; if fermentation is allowed to proceed too far, the starch and mucilage are, to some extent, destroyed, and the *acetous fermentation* commences, which develops vinegar, rendering the bread disagreeable and sour; and if the fermentation is allowed to proceed still further, the gluten is more or less decomposed, literally *rotted*, and the *putrefactive stage* of fermentation exists; the bread is then exceedingly dry, harsh, and as unpalatable as a dirty chip. It will be seen, therefore, that the management of yeast bread requires the most careful attention, and affords room for the exercise of no small degree of judgment. It is a common error to regard bread as not over-fermented unless it is sensibly acid to the taste. Fermentation may be carried so far as to destroy the richness and sweetness of the loaf, and yet arrested by the heat of the oven at a point just short of developing any appreciable sourness. It is here that the majority of domestic bread-makers fail. If it does not feel sticky and heavy, on the one hand, nor taste sour, on the other, it is pronounced good. But all really good bread must, in addition to these negative qualities, possess the

positive recommendation of being in every way delicious to the senses.

Whether fermented bread is made of fine or superfine flour, or unbolted meal, it requires essentially the same management. Wheat-meal, or Graham bread, however, requires, on account of the swelling property of the bran, a somewhat softer or thinner sponge than that of wheaten flour, and it should be baked one half longer; an ordinary loaf should remain in a brick oven about one hour and a half. Although, as already remarked, wheat-meal makes the best fermented bread, yet good rye-meal, or this, coarsely ground, and mixed with Indian-meal, makes a very good article of bread.

Raised bread, or bread made light by means of acids and alkalies, is used to some extent in this country and in England. It has been thought by some that this method of bread-making was an improvement on the fermenting process; but in numerous experiments I could never succeed as well with acids and alkalies as with yeast, nor do I conceive the plan to be as healthful, provided both processes are managed in the best possible way. It is true that a part of the sugar is destroyed by fermentation, and it is true that if the acid and alkali usually employed exactly neutralize each other there is no extraneous ingredient formed and retained in the bread except common salt, while all the natural properties of the grain are left unchanged. The "choice of evils," then, is between the absence of sugar in one case, and the presence of salt in the other. Which is the greatest evil?

For making the best unfermented raised bread the sesquicarbonate of soda and hydrochloric acid are employed, in the proportion of forty grains of alkali to fifty drops of the acid. The alkali is dissolved and diffused through the mass of dough, and then the acid is diluted and worked into the dough as rapidly as possible. The hydrochloric acid combines with the soda of the sesquicarbonate, forming common salt, and the carbonic acid gas is set free to puff up the dough. Those who esteem salt an alimentary article, will reasonably presume that this bread is better than fermented; and those who add a large quantity of salt to their fermented bread, as indeed most commercial and public bakers do, will have an additional argument in favor of the raised as compared with the fermented bread. Besides, the raised bread has the actual advantages that it may be put into the oven as soon as mixed, and eaten when recently from the oven without detriment, which is not the case with the fermented, although most persons do eat it fresh from the oven, and take the consequences. But I do not regard salt as an aliment; n fact I consider breads of all kinds essentially deteriorated, not only in flavor and consistence, but in physiologi

cal properties, by the admixture of salt in any quantity. It is the very last place where salt should be used, if employed at all. All the cereal grains, wheat especially, contain considerable quantities, comparatively, of earthy phosphates, principally phosphate of lime, which seem to be appropriate for the sustenance of the bony structure; but any additional and unnecessary admixture of saline or earthy matters in those aliments which are already specially furnished with saline and earthy materials, must be the *very worst* use we could make of them. If salt must be taken, let it be with those articles of food which contain the *least*, instead of the greatest proportions of earthy and saline matters, as grapes, apples, cucumbers, milk, and flesh-meats.

There are a few *general rules* in regard to bread-making which may be conveniently summed up in this place: 1. The best ovens are constructed of an arch of brick, over which is a covering of ashes, and over this a covering of charcoal, with a finishing layer of bricks over all. This arrangement retains the heat so long that cakes, apples, and pies can be baked after the bread is taken out, and custards and other light articles after them. 2. A new oven should be heated at least half of the day previous to baking in it, and the lid kept closed after the fire is out until heated for baking. 3. The fire should be made nearly on the back side of the oven. 4. The oven must be heated till all the bricks look red, and are free of all black spots, but not hot enough to burn flour *quickly* when sprinkled on the bottom. A better test is the thermometer. 5. Bread is light enough for the oven as soon as it looks porous and full of holes, like sponge; it will also exhale a brisk, pungent, but not in the least degree acid, odor. 6. When bread becomes light enough before the oven is ready, it should be kneaded a little, and then kept in a cool place. 7. When the loaf does rise too much, the best corrective is to knead in a solution of bicarbonate of soda, about a tea-spoonful for every three quarts of flour. 8. When taken from the oven bread should always be taken out of the pans or tins and placed endwise, and if the crust is very thick and hard, the loaf should be wrapped in a cloth wrung out of cold water. 9. In making the sponge for fermented bread, the water or milk employed should be about blood-warm. 10. When the dough has been properly kneaded, it should be covered with a napkin or light woolen blanket, and kept at about summer heat, say 60° Fah., until the dough becomes light. 11. In very warm weather the sponge should not stand over night, unless kept in a very cool place; even then better bread can be made by mixing the sponge in the morning, and baking in the afternoon. 12. All bread-makers should remember that the process of fermentation is arrested at a temperature below 50° Fah. that it pro-

ceeds slowly at 50°, moderately at 60°, rapidly at 70°, and very rapidly at 80°.

b. Boiled and Roasted Grains and Seeds.—Good clean *wheat*, boiled in pure soft water, and eaten with a little sugar, syrup, cream, or milk, is an excellent dish as part of a dietetic course. It requires boiling nearly all day to become entirely soft, hence the cracked wheat is much more convenient. Those who would have a *tasting* appreciation of the vast difference in the gustatory properties of different samples of the same article, should eat, without any seasoning whatever, boiled wheat which has been raised on a new, fresh, virgin soil, and that raised on an old, worn-out, badly-tilled and viciously-manured farm. The contrast might remind one of pine-apples and pine shavings.

Rye, *barley*, and *corn* are equally wholesome, prepared in the same way, but not as pleasant. It is difficult to remove the skins of corn, even by a long process of boiling, without the use of ashes, or some other alkali.

Rice is a good food when well boiled, but is too nutritious to eat alone. Those who employ it freely require a good proportion of potatoes, or other vegetables or fruits, with it. When cooking, it should never be stirred so as to break up or mash the kernels. A very pleasant but rather rich dish is made by boiling the rice in water until soft, then stirring in a little milk, and simmering them together about fifteen minutes. Boiled rice is often used as a vegetable with the ordinary dinner, and as a dessert after dinner. For both purposes it is too nutritive, unless the dinner is extremely simple and abstemious.

Boiled *peas* and *beans* are perfectly wholesome at all stages of their growth. Very young peas want cooking but very little. Beans are liable to produce more or less flatulence, except in stomachs long accustomed to a very plain vegetable diet. They are more tough and indigestible when boiled in salted water, as the salt hardens the outside membrane or skin. If salt is employed, it should be added as they are eaten. There are no vegetables that the taste which has been trained to the love of salt, so dislikes without it as rice and beans; hence most cook-books direct that those articles have plenty of salt *cooked through* them. I know individuals, however, who have so overcome the desire for this condiment that they like even rice and beans better without it than with it. The small white bean is an excellent vegetable for winter use. It may be simply boiled in water, and seasoned with a little salt and milk, or afterward baked.

Boiled *green corn* is usually put down as bad food by medical and dietetical writers. I can discover no reason for its condemnation. I

have employed it freely for years at a table for invalids, among whom were always a greater or less number of dyspeptics, and I have never seen any evil result from it. On the contrary, I regard it, when tender and milky, as excellent. I suspect the mischief imputed to it is due to the butter and salt with which it is usually eaten. It is also generally cooked in salted water, which has a peculiar effect in rendering it hard and indigestible, much more so than is the case with peas or beans. It is incomparably better when boiled in pure water, and eaten with salt added to it, than when cooked in salt. The sweet corn is the best for boiling when green.

Succotash, which is a mixed dish of boiled green corn and boiled stringed beans, is a delicious and wholesome food, when seasoned with a little milk or sweet cream, with but very little if any salt.

Roasted green corn is not particularly unwholesome, though not as good as boiled. *Parched corn* is a favorite dish and principal food with some semi-barbarous nations, and in some parts of South America. It is perfectly wholesome. *Roasted wheat*, *rice*, *buckwheat*, *oats*, *barley*, and *chestnuts* are wholesome, but the process of cooking all of them, except the latter, is too inconvenient to deserve much consideration. Rice, when torrefied, is considered more constipating than when boiled, and has hence been prescribed in cases of diarrhea. Those who *must* have some substitute for tea, coffee, cocoa, and chocolate, besides water and milk, will find a pleasant beverage in the infusion of the roasted seeds of wheat, oats, or barley—equal, in fact, to the famous "crust coffee," made by steeping toasted bits of bread-crust in hot water.

c. Mushes.—Wheat, rye, and corn are the only grains much employed in the preparation of mushes; oatmeal is occasionally used. They are all made by boiling in pure, soft water, though in a very few dishes more or less milk is used. *Wheaten grits*, or *cracked wheat*, ranks at the head of the list of mushes. As usually put up at the mills, wheaten grits require to be boiled five or six hours. If the grain is broken up finer, it may be cooked in a much less time. My own plan for several years has been to procure the common grits, made from the best Ohio or Western wheat, and run them through a hand-mill, or large coffee-mill, whenever they are wanted for cooking. This secures the full flavor and freshness of the grain, and grinds the grits fine enough to be well cooked in an hour and a half. The most convenient method of boiling them is by means of a tin or iron vessel surrounded by hot water, and contained within another vessel which comes in contact with the fire. This obviates the necessity of constantly stirring to prevent them from burning on the vessel. They may be

managed very well in an iron pot with legs, so that the vessel can stand on the range or stove without coming in direct contact with the fire. Milk, or a moderate quantity of molasses or sugar, are the only admissible seasonings for all kinds of mushes.

Hominy is one of the best mushes. In this market it is prepared from the Southern or white corn. The fine-grained hominy is usually boiled about an hour; it may be very well cooked in half an hour by boiling a few minutes, and then steaming it, without stirring, over as hot a fire as can be borne without burning. The coarse hominy, or *samp*, requires boiling five or six hours. It should be washed several times, and the water poured through a sieve, to separate the hulls. Two quarts of water to one of hominy are necessary.

Rye-meal makes an excellent mush, and is particularly useful in cases of habitual constipation; to those unaccustomed to the grain, its effect on the bowels is decidedly laxative. It is made precisely like cracked-wheat mush.

Indian meal, if coarse-ground, makes a good mush known as *hasty pudding*. White and yellow meal are equally agreeable to most persons in this dish. It should be stirred rather stiff, and cooked about fifteen minutes.

Oatmeal mush is a favorite with some persons, and it makes a pleasant change for all. It is cooked precisely like Indian meal mush. In Scotland it is called *stirabout*.

Graham flour, or wheat-meal, is sometimes cooked in the form of mush; it may do for a change, but is not as good as the coarser preparations of wheat. For infants and young children it is much better than the farina which is so extensively used.

Farina is occasionally made into mush, but I consider it too nutritious and concentrated to be employed in this way as a leading article of food, or as a principal part of a single meal.

d. Gruels and Soups.—Gruels are merely thin mushes; they are usually prescribed to invalids laboring under fevers and acute inflammations, or for the purpose of promoting the action of the bowels. For the latter purpose coarse *Indian meal*, *Graham flour*, or *cracked wheat* gruel are the best. A couple of spoonfuls of flour or meal are sufficient for a quart of water. It need boil only for a few minutes. *Rice* is sometimes made into a thin mush or thick gruel, for the table. It helps to make up a variety.

But few vegetable soups are desirable. *Split peas*, soaked over night, and then boiled until completely diffused in the water, make one of the best dishes of this group. A pound of peas is sufficient for

wo quarts of water. *Garden beans*, and *common field peas*, and the *marrow fats*, either green or dried, may be made into tolerable soups. Cook-books generally recommend saleratus to be put into all vegetable soups, and indeed into nearly every vegetable preparation that can be named, on the idle supposition that there is something terrible in the shape of an acid in every thing vegetable, which requires to be neutralized. It is a pernicious custom; it is giving the stomach an actual poison to counteract an imaginary one.

e. *Puddings.*—The majority of puddings found at ordinary hotels, boarding-houses, and refectories, are vile compounds. Plain puddings are generally farinaceous mushes, in which sugar and milk are cooked. The addition of eggs renders all puddings indigestible for weak stomachs, and unhealthful for all. The best kinds of plain puddings are not so objectionable in themselves as a part of some of the meals, as they are liable to be swallowed hot, unmasticated, and at the end of a full meal of other things. The very best puddings are made of cracked wheat, rye-meal, hominy, rice, stale brown bread, and Indian meal. Potato and apple puddings are very good, and several other kinds are perfectly admissible.

Cracked-wheat pudding is made by boiling the grits perfectly soft in water, adding a due quantity of clean brown sugar, or good New Orleans molasses, and milk, and baking in a moderate heat.

Rye-meal, *hominy*, *rice*, and *Indian meal* puddings may be prepared in precisely the same manner. Hominy and Indian require a hotter oven than the other articles.

Bread pudding may be made by soaking pieces of stale but sweet bread in milk until soft, then sweetening and baking it. A very good method is to cut a hole in a loaf of bread, add as much new milk as it will soak up through the opening, tie it up in a cloth, and boil it an hour.

Potato pudding may be made of Irish or Carolina potatoes. Mix into a stiff paste two parts of boiled and mashed potatoes, and one part of wheat-meal; tie it in a wet cloth dusted with flour, and boil it two hours.

Apple pudding is made in various ways. One good method is to alternate a layer of prepared apples with a layer of wheat-meal dough, until a tin pudding-boiler is filled, then boil three hours. Layers of soft-boiled rice, in lieu of the wheaten dough, make another kind of apple pudding.

Rice and apple pudding is prepared by boiling half a pound of rice in a pint and a half of milk, till it is soft; then fill the pudding-dish

half full of apples pared and cored; sweeten with molasses or brown sugar; put the rice over the fruit as a crust, and bake.

Cracker pudding, of Graham or wheat-meal crackers is made in the same manner as bread pudding.

Tapioca pudding is made by pouring a pint of boiled milk on half that quantity of tapioca; let it stand half an hour, then add another pint of milk, sweeten, and bake. *Sago* pudding is made in the same way. These are very bland, and not very nutritive, and their principal value is to fill the stomach and satisfy the appetite when but little nutrition is desirable or practicable.

Corn starch pudding is prepared by mixing the starch with a sufficient quantity of milk to give it the due consistence, then sweetened and baked. It is rather indifferent as an article of diet, and when made with eggs decidedly bad.

Sweet apple pudding is made by putting a dozen good ripe sweet apples, cut into pieces, into a quart of milk, with a pint of Indian meal, and baking about three hours. If the apples are not very sweet, a little molasses may be added.

Snow-ball pudding is made by paring and coring large apples, and inclosing them in cloths spread over with boiled rice; they are then boiled an hour. They should be dipped in cold water before being turned out of the cloths. They may be eaten with syrup or sugar.

Cottage pudding is one of the best preparations of which eggs form a part: Mix two pounds of pared, boiled, and mashed potatoes with one pint of milk, three eggs, and two ounces of sugar, and bake three quarters of an hour.

Custard pudding is a preparation in which eggs are much more wholesome than they are in other puddings, particularly the farinaceous kind: Mix four eggs, well beaten, with a quart of good milk, and three table-spoonfuls of clean brown sugar; bake in custard cups, or a common pudding-dish about half an hour.

Apple custard is another dish preferable to farinaceous puddings which contain eggs: Pare and core half a dozen good ripe, mealy, tart apples; boil them in a small quantity of water till moderately soft; put them into the pudding-dish, and sugar them over; then add eight eggs which have been beat up with three table-spoonfuls of sugar, and mixed with three pints of milk, and bake half an hour.

Macaroni, *vermicelli*, and *arrow-root* are sometimes made into puddings; but there are so many better articles they are not worth the trouble.

f. Pastry.—"All pastry is an abomination," says Paris, with whom

the majority of dietetical writers coincide. The expression is not too strong in reference to pies, as they usually come to our tables from the bakeries. Nevertheless pies *may* be made very good and wholesome, even much better than the majority of plain puddings. Pies, as they should be made, are but little different from bread and fruit, with an extra quantity of sugar. The crust of a baker's pie is better adapted to kill a hyena than to nourish a human stomach; and the crust of ordinary home-made or domestic pies is too full of meat-drippings, hog's lard, or butter, to be otherwise than pernicious to the stomach. But pie-crust can be made in a healthful manner. I know the majority of appetites will consider it harsh, rough, and tough, and many will turn away from it in disdain, because they cannot swallow it without masticating. But the fault is with the wrongly-educated appetite, not with the healthful article. It seems a sad pity that our fashionable eaters, who are so violently opposed to chewing their own victuals, can not employ servants to perform this necessary duty for them, or invent some labor-saving masticating machine!

Excellent pie-crust can be made of wheat-meal, modified or shortened with good mealy potatoes and fresh sweet cream. Rich new milk answers very well in the place of the cream, and if the fastidious appetite insists on having the crust a little smoother, the coarsest part of the bran may be sifted out. In the absence of cream, the crust may be raised or made light with sour milk and super-carbonate of soda, an alkali much less objectionable than saleratus, and the only one that ought to be employed in cooking. Indian meal may be used in lieu of wheat-meal in forming the crust; equal parts of each may be employed

Nearly all the mild, sub-acid, and sweet fruits may be made into pies; many kinds of pumpkins and squashes make delicious pies; some roots and leaves, as potatoes and sorrels, make very good and wholesome pies. A few specimens of the best kinds will answer the purposes of this work:

Apple pie may be made of green apples cut into thin slices, or of dried apples stewed, or of the fruit which has been preserved in its own inspissated juice. Moderately tart and very juicy apples make the best apple pie. Brown sugar or molasses is the best sweetening for all kinds of pastry.

Pears and *peaches*, when thoroughly ripe, make excellent pies, managed the same way as apples.

Currants, when very young, or when perfectly ripe, are not objectionable. *Gooseberries* and *cranberries* are too acid, in all stages of their growth, for this use, although I do not apprehend a sound stomach well trained to a vegetable regimen would experience any diffi

culty from their employment. Indeed, I know individuals who can and do use them without any apparent disadvantage.

Strawberries, *red raspberries*, *black raspberries*, *blackberries*, *whortleberries*, *black cherries*, and *red cherries*, all in their season, when fully ripe, make delicious pies and tarts.

Pumpkins and *squashes* are equally delicious and healthful. They are to be boiled, mashed, strained, mixed with milk or milk and water, moderately sweetened, and baked on a single crust. Of pumpkins, the *West India* is the best our market affords for pie-making, and among the best squashes for this purpose are the *cream* and the *pumpkin*.

Potato pies are not as inviting as the preceding. The sweet potato is the best. It is cut into squares, with a little sliced turnip, covered with milk or cream, and then with a crust.

I have heard *tomato* pies well spoken of, but I have had no experiance in their making or tasting.

Rhubarb pie is made by stewing the cut stalks till tender, straining, sweetening, and baking on an under crust. In the usual method of pie-making, eggs are added. This pie is rather too acid for weak stomachs.

Meadow sorrel, stewed and sweetened, is much less acid, and, to my taste, more pleasant than rhubarb, when made into pies or tarts.

Custard pie is one of the best ways of eating eggs, providing the pie is made of nothing but eggs, sugar, and milk, and a crust as herein advocated.

g. Cakes.—But very few kinds of cake are agreeable or desirable to those whose appetites are under the guidance of a reasonable degree of reason; and to all others no extent of variety and complication can give satisfaction. The following list comprises the best preparations of cake I am acquainted with:

Wheat-meal cakes, made of fresh Graham flour, good brown sugar, and sweet cream, raised with sour milk and super-carbonate of soda, and well baked, is a much superior article, as far as health is concerned, to either of several hundreds, the recipes of which are found in common cook-books. Sweet cream makes a much richer and sweeter cake than lard or butter. If the cream is moderately sour, its acid will be sufficient to neutralize the soda without the sour milk. A very fair article can be made without the cream. This kind of cake, if preferred, can be raised with yeast, but it should not, in such case, be eaten till the next day.

Fine flour cake can be managed in the same manner, but it is not as

good as the coarse. When fine flour is used, molasses is better than sugar for sweetening.

Indian meal cake, made of coarse yellow Indian meal, is very light and tender made in the same way. It is very good without the cream. It should be sweetened but moderately. Eggs are almost always put in all kinds of Indian cake, but I think it is as pleasant without them, and it is certainly more healthful.

Biscuits of wheat-meal or fine flour, or of wheat and Indian, or rye and Indian, may be made by the first-mentioned process, omitting the sugar

Good *gingerbread*, "with the part of ginger omitted," and also without alum and potash, can be made with rye flour, New Orleans molasses, and sweet cream, raised with yeast, or with sour milk and super carbonate of soda, and baked in small, thin cakes.

Griddle-cakes are made of buckwheat flour, fine flour and Indian meal, wheat-meal, wheat and Indian meals, wheat-meal and rice, or of rye-meal alone, or with either of the other meals. They may be raised with yeast, or with sour milk and super-carbonate of soda; the latter is the best method, because all fermented food is objectionable when eaten immediately after cooking. They are wet up with milk or water, or both, according to taste, and they may be baked on a soapstone griddle without a particle of grease. Sugar, molasses, or milk, is their proper accompaniment for seasoning.

Wheat-meal, with a very little coarse Indian, and three parts of rye-meal to one of Indian, make the very best, sweetest, and most wholesome kinds of griddle-cakes. Buckwheat is improved by the addition of a small quantity of Indian. All of them, however, are very good alone. Rice griddle-cakes are prepared by mixing soft-boiled rice with a little flour or wheat-meal. Those who are not provided with soapstone griddles are obliged to use a little oil of some kind to prevent the batter from adhering. Olive oil, when perfectly sweet, is much better than lard or butter for this purpose. Good olive oil may also be used as a substitute for butter in oiling bread, cake, and pie pans, or in shortening bread or cakes for those who have not cream, and will have shortening of some kind.

h. Roots.—All of the esculent roots—potatoes, beets, carrots, parsneps, turnips, ground-nuts, artichokes, comfrey, etc., are equally healthful *per se*, but of different degrees of nutritive power, and of very different degrees of adaptability to weak stomachs, or stomachs accustomed to the ordinary concentrated or mixed diet. The potato, ground-nut, comfrey, and artichoke, are called *mealy* roots, the others *watery*

The potato far exceeds all the rest in amount of nutritive property, and is alone capable of sustaining the prolonged nutrition of the human being.

Boiling is the best method of cooking potatoes; *roasting* in the ashes is the next best process and *baking*, the next. When boiled, they should be taken out of the water as soon as they can be easily pierced with a fork, and then steamed about five minutes. Some prefer steaming instead of boiling; the difference is very trifling. They are always richer flavored and more nutritious when cooked with their skins on, especially in the fall and early part of winter. A potato should always be pared very thin. Some cooks prepare them by washing and paring, and soaking in cold water over night; others put them, pared or not, as the case may be, into boiling water at first. The former is the best method for new, and the latter for old potatoes.

Cold boiled potatoes, cut into slices, and slightly browned on a griddle, make an excellent relish as a part of the breakfast, and are not to be despised as a whole breakfast. For dyspeptics who have craving appetites, and for all who are liable to eat too much bread, or other very nutritive food, potatoes prepared in this way are peculiarly serviceable.

Boiled potatoes, jammed up with a little milk or sweet cream, and seasoned with a very little salt, make as rich a vegetable dish as any one ought to crave. When cold, they may be warmed up in milk, as a part of either meal.

The Carolina, or sweet potatoes, may be cooked in the same ways precisely as the common potato. They are generally preferred when roasted; they are delicious either baked or boiled. All the other mealy roots may be cooked in the same manner as the potatoes.

The watery roots are of essential service in a dietary system of which farinaceous food or flesh-meat, or both, constitute the leading features. The parsnep, when boiled, is among the most digestible and nutritive of this division. It keeps well through the winter, and is most sweet, tender, and wholesome in the latter part of winter and early in the spring, the very time when most needed, on account of the absence of fresh fruits and the scarcity of green vegetables. A rich and excellent dish may be prepared by cutting the root into thin slices, boiling it in water until soft, and then simmering it a few minutes in milk. The beet requires boiling a long time; it should always be cooked until perfectly soft. The turnip should be thoroughly boiled, but taken from the water as soon as well done. The carrot is more nutritive than the turnip, but less so than the parsnip or beet; it is not usually relished as well without seasonings as the other watery roots. All of these roots may be roasted, baked, or stewed in water or milk.

They are most frequently *fried* at common hotels and boarding-houses, but that is, of course, the worst manner of cooking them. The radish possesses a very little nutriment, but its acrid property is objectionable, and as there are so many better things to eat, it is hardly worth retaining.

In selecting the watery roots, great pains should be taken to get those which are tender, brittle, and juicy. All the tough, dry, fibrous articles should be rejected.

4. *Green Vegetables.*—Many of the articles known as "greens," or "spinach," are slightly nutritive and perfectly wholesome, and, like the watery roots, they help to make a variety, and also offset the too highly nutritive property of farinaceous food, and the too stimulating property of animal food. Asparagus is one of the blandest, and most delicious and nutritive of the class. It is good enough for any one to eat with no preparation but simple boiling. The weakest and most dyspeptic stomachs can almost always use it with comfort and satisfaction. Water-cress, celery, onions, and lettuce are generally eaten as salads. The first three are too acrid, and the latter is too narcotic. Boiled onions are not objectionable, except from their rank and, to many, disagreeable odor. Boiled mustard leaves, potato tops, cabbages, cowslips, spinach, young beet plants, and a variety of other leaves, leaf-stalks, buds, shoots, flowers, are perfectly healthful to healthy stomachs. When cooked in butter, or boiled with salted meat, or mixed with vinegar, they are objectionable only on account of their accompaniments. Lemon juice makes as pleasant seasoning as vinegar, and this or some other *organic* acid is all the condiment that can be admitted with a consistent regard to physiological truth.

Whenever greens or vegetables are employed, they should be perfectly fresh, not dry, wilted, nor long kept.

5. *Fruits.*—As a general rule all sweet and sub-acid fruits, when full-grown and perfectly ripe, are most wholesome, if eaten without any preparation or seasoning. If, however, they are too sour, a little sugar may be added, and the very acid fruits, as well as those not perfectly ripe, are improved by stewing and sweetening. I have never found good grapes to disagree or produce even temporary inconvenience in the most delicate stomachs. I regard them as always preferable without cooking. Apples, pears, and peaches always agree with all healthy stomachs, and the worst dyspeptics may soon acquire the habit of eating them, not only with apparent impunity but with absolute advantage, by partaking of a very little at first, and gradually increasing

the quantity. Baked apples stand at the head of the class of cooked fruits. Apples, pears, and peaches may be made into an elegant dish by paring, boiling, sweetening with molasses, and serving them whole. This is an excellent method of preparing peaches which are not perfectly ripe, and but few sold in our city markets are so. Pared, and cut into slices, and sprinkled with sugar, is another very common and very good preparation. It is a common prejudice that there is something unwholesome or pernicious in peaches which the skin tends to counteract or correct, hence both ought to be eaten together. The fact I believe to be, that both skin and pulp are perfectly harmless. Tomatoes, when fully ripe, are among our best fruits, and are relished by many persons without cooking. An excellent dish is made by scalding them a few minutes, to loosen their skins, peeling, and then stewing them slowly for an hour, or even two (as they are improved by cooking a long time), and then adding pieces of toasted bread.

Water-melons and musk-melons are liable to produce colic and flatulence in very weak stomachs, but are unobjectionable as a part of the dietary system of those whose digestive powers are not greatly impaired. The variety of musk-melon called *nutmeg* is the richest.

It is the general fault of dried fruits that the poorer qualities are selected for drying. Those who purchase them in reference to their dietetic character, should select such as are of good, rich flavor, and not very acid. Dried raspberries, strawberries, whortleberries, and blackberries, stewed and sweetened, make a good addition to dried apples and peaches. Most of the dried plums which are sold in our markets are too sour for pleasure or profit. Dried cherries are a troublesome article to handle on account of the stones, but they are among the most wholesome articles. French prunes, stewed and moderately sweetened, are excellent. The boiled fig is a good and very nutritious fruit.

Pumpkins and squashes can be readily dried for winter use, by being cut into thin slices, and exposed to the sun, or placed in a heated oven. *Peach leather* and *tomato leather*, are prepared by squeezing out the pulp of the fruits when very ripe, and spreading them half an inch thick on plates or shingles, to dry until quite hard. Ripe tomatoes are sometimes cut into slices without peeling, and dried in an oven. *Tomato figs* are made by scalding and peeling the fruit, then boiling it in one third its weight of sugar. The figs are then flattened, and dried in the sun, occasionally turning them and sprinkling with sugar.

Currants and gooseberries are too acid for the majority of invalid stomachs. They may be preserved in the green state, but are not worth the trouble.

k. Nuts.—These, with the exception of the boiled chestnut, perhaps, are not proper food for invalids, although, as previously remarked, they are adapted to the digestive organs of man, and other frugivorous animals, in a state of nature. The butternut and walnut are too oily, an objection which no cookery I am acquainted with can obviate. The peanut and beechnut are less oily, but so long as the world is full of better things invalids would do well to use them.

l. Condiments.—In relation to condiments or seasonings, I have named milk, sweet cream, sugar in some form, salt, and the vegetable acids, as the only admissible ones. With the exception of salt, they are all more or less nutritive, and are really different forms of food. Although the most perfect nutrition can be secured without the aid of any of them, yet their moderate employment is not especially injurious, but, in reference to the imperfect character of many of our fruits and vegetables, sometimes an actual advantage; and it is a great step in advance if we can induce the highly cultivated and grossly pampered appetites of civilized society to submit to the simplicity here enjoined. The great misfortune of the vast majority of people, and of invalids especially, is that they have stimulated away, or so palsied the organic instincts that they can not appreciate the intrinsic properties of food. Every thing is flat, insipid, and unsatisfactory, save perhaps the best kinds of fruit, unless strongly charged with some extraneous seasoning. If we can induce them to abandon all cooked oils, greasy gravies, strong spices, and the whole list of enervating beverages, we can cure them of their diseases, and when they are restored to such a degree of health and vigor as their remaining constitutional vitality admits of, they may take as many progressive steps as they please in simplifying and improving their whole plan of diet. There is room in this direction for the exercise of the best talent and noblest energies of the human mind.

CHAPTER III.

DIETARIES.

GENERAL RULES FOR INVALIDS.—Although all kinds of natural food agree equally well with all persons in a pure state of nature, excepting so far as the mere influence of habit is concerned, we have now to

deal almost wholly with men in an artificial state. In a great variety of alimentary materials, therefore, all of which are intrinsically wholesome, there is an opportunity for the exercise of considerable skill in adapting them to invalids, and so managing them as to restore the deeply-injured digestive powers and broken-down constitutions to comparative health and strength. The following rules, which are but a summary of the principles indicated in various parts of this work, may serve as a kind of chart to those who are not thoroughly familiar with all the therapeutic adaptations of diet.

1. The general errors in diet are too great *concentration*, improper *combination*, excessive *quantity*, and imperfect *quality* of the alimentary materials. Each of these errors is equally important to guard against.

2. The diet may be equally simple and wholesome whether the number of articles employed be three or three hundred, provided but few articles are eaten at a single meal.

3. Of whatever materials the diet consists, the due relations of nutriment and bulk must be maintained. Thus those whose food is principally preparations of the cereal grains, require the largest proportion of juicy fruits and watery vegetables; those who eat principally animal food and potatoes, require a less proportion of the less nutritious foods; and those who eat potatoes and other less nutritive roots freely, with little bread or meat, require the least of the watery vegetables and fruits, etc.

4. Chronic diseases of the digestive organs are always attended with constipation, diarrhea, or irregularity of action; in ninety-nine cases in a hundred constipation is the primary morbid condition. All these morbid conditions require essentially the same plan of diet, but there are two diseased states not uncommonly met with, where a peculiar modification of the general plan is desirable, if not necessary. One is an inflamed, abraded, or ulcerated condition of the mucous membrane of the duodenum, consequent on the acrid, corroding bile which is emptied into that intestine from a diseased liver; and the other is the same condition of the rectum, or lower bowel, consequent on the existence of hemorrhoids or piles. In these cases unbolted farinaceous food, brown bread, cracked wheat, etc., often irritates and increases the pain and mucous discharges, and as local quiet is important for the healing process, a diet of mealy potatoes, baked apples, or raw grapes, with a *very* little farinaceous food, which may be farina, arrow-root, tapioca, or even wheat-meal, will afford the patient more quiet and facilitate the cure.

5. Invalids whose diseases have been specially produced by particu-

lar articles of food, or a particular plan of diet, will almost invariably be inordinately attached to those articles of food, or that plan of living. Thus gout is often produced by concentrated farinaceous food, and it is very rare to find a gouty subject who has not a strong repugnance to all other kinds of farinaceous food. Those patients, too, whose diseases are attended with an inflammatory diathesis produced by the excessive use of flesh-meat, will almost always manifest a particular horror toward just what they need—strict vegetable diet. No person is more wedded to or more passionately fond of strong green tea and fine tea biscuits, than the female whose stomach is contracted to half its natural size, and whose whole nervous system is completely shattered by their use; and no spoiled child is more crazy after candies and sweet cakes than one rendered feeble, dull, gaunt, and cachectic by them. These facts should be understood by both patient and physician; by the latter that he may prescribe successfully and intelligently, and by the patient, that through the tribulation of denying a morbid appetite, he may work out a salvation from its consequences.

6. Invalids who have lost health under the ordinary way of living, should select a moderate variety of the very best articles of farinaceous food, and the mildest fruits and vegetables, and persevere in their use until health is re-established, gradually proceeding to the use of the coarser articles, or those fruits and vegetables which are called crude and flatulent. By managing carefully in this way, very bad dyspeptics will in due time be able to partake of nearly all healthful articles without discomfort.

7. No rule can be given for weighing or measuring the quantity of food for invalids, as it varies with age, exercise, temperament, and pathological condition; a correct practice is to eat sufficient to satisfy all demands of actual hunger, but not to the extent of producing a sense of oppression in the brain and muscular system. If the appetite be not excessively morbid, the intelligent observer will soon find, in the sense of hunger in the stomach on the one hand, and the feeling of weariness, fullness, oppression, and dullness in both body and mind on the other, where the golden mean of practice lies. But in extremely morbid states of the digestive organs, attended with a craving sensation, instead of natural appetite, the best practice is to apportion out such quantity as the judgment approves in view of all the circumstances of the patient, and adhere to it until a good degree of natural appetite is restored.

8. Above all things let the patient not become a *monomaniac* on the subject of diet. It is infinitely less injurious to eat too much, or too little, or something not strictly physiological, than to be always worrying

for fear some error has been or will be committed. The mind must not be continually directed to the stomach, and on the watch for some new or old feeling or symptoms, to be modified, mitigated, or aggravated after every meal. The judgment should be convinced that the general plan is right, and that Nature has reserved to herself the ability to correct slight deviations.

THERAPEUTIC DIVISIONS OF DIET.—The "old school" works on diet and regimen give us eight technical divisions of diet, for medicinal purposes. As truth can always be seen to better advantage when contrasted with its opposite, it may be useful to mention briefly the system we pronounce erroneous.

1. *Full, Common, or Meat Diet.*—This consists of plain animal and vegetable foods, according to the patient's appetite; and generally in indolent diseases, as scrofula, chorea, epilepsy, etc., and during the convalescent stage after fevers, beer, wine, or ardents spirit is recommended with it.

2. *Animal Diet.*—An exclusive diet of animal food is recommended only in the disease called diabetis. Pereira tells us that when patients are limited to animal food, a considerable variety is necessary to prevent him from loathing one kind frequently repeated, and for this variety Dr. Pereira names: "*Butcher's meat, bacon, poultry, game, fish, shell fish, cheese, eggs, sausages,* and *brawn;* and for *common drink,* to go with it, *water, beef-tea,* or *mutton-broth.*" This is sufficiently *strong,* in all conscience, for any sick person, but we have not a particle of evidence in medical books that a single diabetic patient ever got well upon it.

3. *Vegetable Diet.*—Although a vegetable diet is named among the varieties appropriate in certain cases of disease, an exclusively vegetable diet does not appear to be recognized as orthodox in the allopathic materia medica. Pereira disposes of it in the following summary and contemptuous manner: "The exclusive employment of vegetable food, in conjunction with the use of distilled water, has been recommended by Dr. Lambe, as a remedy for cancer, scrofula, consumption, asthma, and other chronic diseases; but he has, I suspect, gained few, if any, proselytes to his opinions and practice."

4. *Spare, or Abstemious Diet.*—This means, in allopathic parlance a mixed animal and vegetable diet, with the use of fish instead of butcher's meat, because the former is supposed to be less stimulating

and less nutritious than the latter. It is principally recommended in the gouty and apoplectic diatheses, plethora, etc.

5. *Fever Diet.*—This is also called *spoon*, *slop*, or *thin* diet. It consists of teas, toast-water, barley-water, and acidulous drinks, *ad libitum*, with light saccharine and amylaceous preparations.

6. *Low Diet.*—This does not differ much in object from the former, although a different set of preparations are named as constituting it, as gruel, broth, milk, bread or biscuit, and light farinaceous puddings. It is prescribed in cases of accident, injuries, surgical operations, and acute inflammations, with the object in view of depleting the system, or effecting a change in the blood similar to that produced by bleeding.

7. *Milk Diet.*—This includes the free use of cow's milk, and a moderate employment of light farinaceous substances, as bread, arrow-root, tapioca, sago, and even rice, batter or bread puddings. It is advised mostly in consumption, and other pulmonary diseases, and after severe bleedings or hemorrhages, and sometimes for the strumous habit of children.

8. *Dry Diet.*—The object of a dry diet is to lessen the volume of blood. in cases of aneurism, valvular disease of the heart; it has also been recommended in diuresis and diabetis. It consists of the ordinary articles of a mixed diet, excluding fruits and watery vegetables, and taken with little or no drink.

As being more philosophical, as well as hygienic, I propose the following technical divisions of hydropathic diet, some one of which will meet the necessities of all classes of invalids, as well as all classes of well folks:

1. *Full Mixed Diet.*—Bread, mush, butter, cream, milk, potatoes, with some kind of fruit, for breakfast and supper; for dinner, bread, vegetables, fruits, plain pudding or pastry, with flesh, fish, fowl, or eggs. This is calculated for persons in health, and for that class of invalids who have no special or disproportionate disease or derangement of the digestive organs.

2. *Full Vegetable Diet.*—Precisely the same as the preceding, omitting the flesh, fish, fowl, and eggs. Milk, cream, and butter are not included in the term *animal food*, whenever the term occurs without being defined in this work. This diet is to be preferred in all diseases attended with the inflammatory diathesis or great irritability of

the nervous system; in gout and rheumatism, in incipient pulmonary diseases, in scrofula, scurvy, neuralgia, in most of the cachexies, and in nearly all of the ordinary female complaints.

3. *Strict Diet.*—Bread, mush, milk, sweet cream, potatoes, and good grapes or apples, or the equivalent to this set of articles for each meal, the quantity to be as exactly proportioned as possible to the nutritive demands of the bodily structures. This is adapted to nearly all chronic diseases attended with neither corpulency nor emaciation, but with a decided yet not extreme dyspeptic condition of the digestive organs. It is admirably calculated for that common and prevalent condition of body known as "liver complaint," and for a variety of nervous, rheumatic, and neuralgic affections which have been preceded by, and are connected with, a long-standing derangement of the biliary secretion; it is peculiarly appropriate, too, in almost all forms of skin diseases. In chronic catarrhal affections, and severe cases of bronchitis, laryngitis, and ulcerations of the throat, it is indispensable.

4. *Abstemious Diet.*—This is the same as a strict diet, with the exception that the quantity of food should be rather below the point of complete nutrition. It is one of the hydropathic methods of depletion, and is the very "hunger-cure" itself. The especial object of abstemious diet is to favor absorption and depuration. It is hence adapted to glandular enlargements, and protracted cases of chill fever, fever and ague, and what is called "dumb ague," all of which are usually attended with enlarged livers and spleens. In malignant tumors, phagedenic and deep-seated ulcers, and foul skin diseases, it ought to be rigidly enforced, as long as the general strength will permit, or as long as the patient can keep about, unless the disease sooner yields. It is also often indispensable in some cases of mucous dyspepsia, attended with great intolerance of food and extreme tenderness in the epigastric region. In blind, or bleeding piles, when they are inflamed and irritable, and the bowels disposed to griping and diarrhea, it is highly advantageous; and in nearly all forms of female complaints, attended with great local relaxation, prolapsus, or other displacement, it is absolutely necessary to a perfect cure.

5. *Dry Diet.*—The object here is to promote healthy and correct morbid secretions. When the saliva is imperfect, the gastric juice deficient or depraved, the bile acrid and irritating, the gums tender and spongy, etc., very solid food, which secures thorough mastication, distends the stomach gradually, and thus promotes the most perfect

digestion, is an almost indispensable means of cure. It is seldom that it requires to be continued long, although no harm could result from continuing it a lifetime, because it is, or should be, composed of a set of articles capable of sustaining perfect and prolonged nutrition. Crusts of bread, roast potatoes, Graham crackers, and uncooked apples, make a good arrangement of dry diet. Many other selections can be made equally as good. Dyspeptics, who are troubled with excessive flatulency, acrid eructations, water-brash, sick headache, etc., are benefited by this diet.

6. *Watery Diet.*—The object of this kind of diet is to satisfy the appetite and stomach, as far as may be, while the necessary amount of nutrient material is supplied, and at the same time wash out and deterge from the body, drugs, minerals, alkaline or saline accumulations, and other impurities. It is in some cases a substitute for, and in many an improvement upon the practice of copious water-drinking. Due proportions of milk, grapes, parsneps, and potatoes, are an example of a watery diet. It is adapted to gravel, calculous concretions, biliary obstructions attended with gall-stones, those forms of gout and rheumatism in which chalky deposits are formed in and around the joints, the disease called *fragilitas ossium*, or brittleness of the bony structure, from excess of earthy particles and deficiency of animal matter. It is also advantageous in plethora and obesity, and may be resorted to in other cases wherein free water-drinking is advisable, but when pure soft water can not be procured.

7. *Fever Diet.*—This term is almost a misnomer. Strictly speaking fever and food are antagonistic ideas. No simple fever, if well managed, requires dieting in any way, save the negative one of starvation, until its violence is abated, and then the diet would more properly be called *convalescent*. It is, however, often desirable to satisfy the stomach or act upon the bowels, for which purpose the Indian or wheat-meal gruel may be administered. Toast-water, barley-water, lemonade, etc., are no better than pure water, as fever beverages; yet they are harmless, and very often gratifying to the patient or friends.

Diet for Public Institutions.—A glance at the established dietary systems of a variety of public institutions will enable the reader to see more clearly, by the contrast, the merits or demerits of the proposed innovations. For this purpose I have made such selections as will present a fair exhibition of the leading ideas of the civilized world on this subject.

Diet of the London Hospital

	Common Diet.	Middle Diet.	Low Diet.	Milk Diet.
Per day	12 oz. bread. 1 pint porter, *men*. ½ pint do., *women*.		8 oz. bread.	12 oz. bread
Breakfast	Gruel.	The same, except that 4 oz. of meat are given instead of 8 oz.	Gruel.	Gruel.
Dinner	8 oz. beef, with potatoes, thrice a week. 8 oz. mutton, with potatoes, twice a week. 8 oz. potatoes, and soup, with vegetables, twice a week.		Broth.	1 pint milk.
Supper	1 pint broth.		Gruel or broth.	1 pint milk.

Diet at St. Bartholomew's Hospital.

	Common Diet.	Broth Diet.	Fever Diet.	Milk Diet.
Daily	Milk porridge. 12 oz. bread. 6 oz. mutton or beef. 1 pint broth, with peas or potatoes, four times a week. 2 pints beer, *men*. 1 pint do., *women*. 1 oz. butter twice a week.	Milk porridge. 12 oz. bread. 2 pints broth. 1 pint beer. 1 oz. butter.	Milk porridge. 12 oz. bread. 1 pint milk, with tapioca, arrow-root, sago, rice, as may be prescribed. Barley-water.	Milk porridge. 12 oz. bread. 2 pints milk, with tapioca, arrow root, sago, or rice, as may be prescribed. Barley-water. 1 oz. butter. Bread pudding three times a week when ordered.

In addition to the *beer*, in the foregoing tables, which English physicians, as well as English legislators and people, seem to regard as "bread in another form," wine, spirit, porter, etc., are permitted as extras, whenever prescribed by the medical officers.

Diet at Guy's Hospital.

	Full Diet.	Middle Diet.	Low Diet.	Milk Diet.	Fever Diet.
Daily	14 oz. bread. 1½ oz. butter. 1 quart table beer. 8 oz. meat, when dress'd.	12 oz. bread. 1½ oz. butter. 1 pint table beer. 4 oz. meat, when dress'd, and ½ a pint broth.	12 oz. bread. 1 oz. butter. Tea and sugar.	12 oz. bread. 1 oz. butter. 2 pints milk.	6 oz. bread. 1 oz. butter. Tea and sugar
	Half a pound of beef (for beef tea), or arrow root or sago, when ordered. For each diet gruel or barley-water, as required.				

The bread mentioned in all of these tables is undoubtedly common baker's bread; nothing is said of its character in the reports. Under the head of *dry diet*, at St. Thomas's Hospital (England), we find: 14 oz. bread daily; 2 pints of *beer!* and water gruel for breakfast; 4 oz.

of butter four times a week, for dinners; and rice pudding and 4 oz. of butter for dinner the other three days of the week. No supper is allowed.

Among the dietaries of Westminster Hospital (England), we find there is a special diet for the incurables, consisting of the daily rations of ¾ lb. bread, ½ lb. meat, ½ lb. potatoes, ¼ pint milk, and one pint of *porter!*

At St. George's Hospital (England), under the head of *Extra Diet*, 2 pints of *beer* are allowed to each man, and 1½ pints to each woman!

Among the dietetic curiosities of Middlesex Hospital (England), is a *Cancer Diet*, consisting of 12 oz. bread, ½ lb. meat, ½ lb. potatoes, and 1 pint milk daily.

Diet at London Lying-in Hospital.

Breakfast.—Tea, and bread and butter, *ad libitum.*
Dinner.—Broth or gruel, until the third day, after which boiled mutton and broth.
Tea.—As breakfast.
Supper.—Gruel, after the ninth day, then bread and cheese and *beer.* Should the patient be delicate, she is allowed wine, fish, light puddings, or any thing she may fancy.

Diet at Bethlehem Insane Hospital.

Breakfast ... Gruel.
Dinner .....Every day..... Table beer.
Sunday.....
Tuesday..... } 8 oz. cooked meat, 8 oz. bread, vegetables.
Friday .....
Monday ..... { Baked batter pudding, 4 oz. bread, 1 oz. cheese, or ½ oz. butter.
Wednesday... { Pea soup, with legs and shins of beef, 8 oz. bread. In the summer months, baked rice pudding, 4 oz. bread, 1 oz cheese, or ½ oz. butter.
Thursday..... { Boiled suet puddings, 4 oz. bread, 1 oz. cheese, or ½ oz. butter.
Saturday .....Rice milk, 8 oz. bread, 2 oz. cheese, or 1 oz. butter.
Supper.....8 oz. bread, 2 oz. cheese, or 1 oz. butter; table beer.
Extras.....*For the Sick* ... { Mutton broth, beef-tea, puddings, fish, meat, eggs, wine, strong beer, etc., or whatever may be ordered by the medical officer.
Christmas Day. { 8 oz. roast beef, 8 oz. bread. (*Mem.* If it fall on a meat day, the patients have a meat dinner on the following day) A mince pie, 6*d.*
New Year's Day.. Plum puddings, in addition to the ordinary dinner.
Good Friday....A bun, 1*d.*
Easter Monday..8 oz. roast veal, 8 oz. bread, vegetables.
Whit Monday...8 oz. roast veal, 8 oz. bread, vegetables.
During the summer, about the month of August, 6 oz. bread, bacon, beans, 8 oz. bread, 1 oz. butter. Fruit, consisting of currants and gooseberries.
In the month of October, apple pies in addition to the ordinary dinner.

The ordinary diet at the Edinburgh Hospital (Scotland), is, for

breakfast and *supper*—1 mutchin of porridge, 3 gills of milk *or beer* or 5¼ oz. of fine bread, *milk or beer!* For *dinner*, on Sundays and Thursdays—1 choppin of broth, 8 oz. of butcher's meat boiled in the broth, or beef-steak, and 5¼ oz. of bread. On Monday, Thursday, and Saturday, a choppin of broth made of beef and bones, barley, groats, potatoes, and vegetables, and 5¼ oz. of bread. On Tuesdays and Fridays, potato soup, with beef and veal, or bones, and 5¼ oz. of bread.

At the Royal Hospital, Phœnix Park (Ireland), the *breakfast* and *supper* are, ordinarily— 1 pint of oatmeal or rice gruel; *dinner*—¼ lb. of meat, 12 oz. of bread, and 1 lb. of potatoes. A *full diet* consists of ¾ lb. of meat, 1 lb. of bread, ½ lb. of potatoes, and 1 quart of *beer!*

The dietaries for the prisons in England and Wales differ principally from those of the hospitals in being more plain and simple. The prisoners who are obliged to work are actually fed more healthfully than in the hospitals, where the physicians are endeavoring to cure. In the prisons the *beer* is omitted; there is a less proportion of animal food, and the suet puddings, mince pies, old cheese, etc., are, fortunately for the inmates, left out.

In the English dietary system for paupers, the *beer* is also omitted, except when ordered by the physician. The following table is a fair specimen of the pauper diet of that nation:

Dietary for Able-Bodied Paupers.

	Breakfast.		Dinner.					Supper.	
	Bread.	Gruel.	Pickled Pork or Bacon, with Vegetables.	Soup	Bread.	Meat Pudding, with Vegetables.	Rice or Suet Pudding, with Vegetables.	Bread.	Cheese.
	oz.	pints.	oz	pints.	oz.	oz.	oz.	oz.	oz.
Sunday, Tuesday, Friday — *Men*	8	1½		2	6			6	2
Sunday, Tuesday, Friday — *Women*	6	1½		1½	5			5	1½
Monday, Thursday — *Men*	8	1½					12	6	2
Monday, Thursday — *Women*	6	1½					10	5	1½
Wednesday — *Men*	8	1½	6					6	2
Wednesday — *Women*	6	1½	5					5	1½
Saturday — *Men*	8	1½				12		6	2
Saturday — *Women*	6	1½				10		5	1½

In the above table, vegetables are not included in the weight specified. Old people of sixty and upward are sometimes allowed 1 oz. of tea, 5 oz. of butter, and 7 oz. of sugar per week, in lieu of the gruel for breakfast. Children above nine are allowed the same quantities as women.

The dietary system of the public institutions of the United States

does not differ very materially from those adopted by the similar institutions of Great Britain. Generally tea and coffee take the place of beer and porter, and a greater proportion and variety of animal food and condiments are allowed.

At the New York Hospital the dietary is: For *dinner*, on *Tuesdays*, *Wednesdays*, *Thursdays*, and *Saturdays*—Beef soup, with beef and potatoes, and bread. On the alternate days—Mutton soup, with mutton and bread. On Mondays—Boiled rice, with one gill of molasses, is served ordinarily. For *breakfast* and *supper*—Black tea and bread; 1 oz. of tea to every six, and a pint of milk to every eight patients. Special diet, as eggs, oysters, chickens, crackers, porter, wine, coffee, etc., is directed by the attending physician.

Diet of the New York City Prison.

Dinner.....Monday .....Mush and molasses.
Tuesday .....Beef, with soup and bread.
Wednesday ....Mush and molasses.
Thursday .....Fresh boiled beef, with soup and bread
Friday.....Mush and molasses.
Saturday .....Fresh beef, with soup and bread.
Sunday.....Mush and molasses.
Breakfast...Coffee, with molasses boiled in it, and bread.

The following dietary table of the New York Protestant Half-Orphan Asylum, furnishes a fair specimen of the diet provided for children in our public institutions:

Dinner.....Monday .....Bean soup, with bread.
Tuesday.....Mutton soup, with vegetables (potatoes, turnips, carrots), and bread.
Wednesday ....Mutton, hashed with potatoes and rice; clam soup, with rice, during the summer months, with potatoes and rice, or balls of flour boiled.
Thursday.....Beef soup, with vegetables and bread.
Friday .....Beef, hashed with potatoes and rice, and bread.
Saturday .....Cold corned beef and bread; except during the summer months, when crackers and cheese are substituted for salt meat, which was found to produce bowel complaint
Breakfast...Bread and milk for the smaller children; bread, with molasses, or sugar, or honey, for the larger ones.
Supper.....Plain bread, except on Sunday evening, when gingerbread is allowed.

At the Pennsylvania Hospital (Philadelphia), for *breakfast*—Tea, coffee, or chocolate, with sugar or molasses, and milk, and common baker's bread, are allowed at discretion. For *dinner*—Soup always; meat of two kinds, [illegible] generally; pork frequently; vegetables according to the season, potatoes always. For *supper*—Tea and bread: no butter allowed, unless prescribed.

The dietary of the Blockley Alms-house (Philadelphia) is very similar to that of the New York City Prison.

The dietary tables of the Baltimore, Providence, and Albany Alms-houses do not differ greatly from that of the Bellevue Alms-house in this city. The following is the general diet of the paupers at the Baltimore Alms-house, which may serve as a sample of the whole:

Breakfast ... Bread, and rye coffee sweetened with molasses.
Supper..... Bread, and tea sweetened with sugar.
Dinner ..... Monday ..... Beef and soup.
Tuesday ..... Mush and molasses.
Wednesday ... } Beef and soup.
Thursday .... }
Friday ..... Herring, mush and molasses, or hominy.
Saturday ..... Beef and soup.
Sunday ..... Pork and vegetables.

The amount of animal food allowed each pauper is 8 oz. of beef, or 5 oz. of pork: each laborer is allowed 20 oz. of bread per day; and all others over one year old, 16 oz. of bread daily.

At the Manhattanville Lunatic Asylum the diet approaches more nearly to that of an ordinary hotel or boarding-house. All the materials are said to be of first quality, and all the articles are allowed *ad libitum*. The following is the table:

Breakfast... Meat, hashed with potatoes, or cold, with bread and butter, coffee, milk, and sugar.
Dinner ..... Monday ..... } Roast meat, beef, mutton, or lamb, with vegetables, rice,
Tuesday..... } flour, bread, or fruit puddings.
Wednesday... } Soup, with rice or Indian mush; pastry on Wednesday.
Saturday ..... }
Thursday ..... Corned beef, with potatoes, and other vegetables, and puddings.
Friday..... Boiled fish (either fresh or salted cod, fresh halibut, shad, mackerel, etc., in their season).
Sunday ..... Cold meat, warm vegetables, pastry, and cheese.
Supper..... Bread and butter, tea or milk; molasses gingerbread on Wednesday; sugar cakes and cheese on Sunday evening.

The intelligent physiologist cannot fail to notice several grave and important errors in the existing dietaries of all our public institutions. In some of them tea or coffee is allowed on some days, and refused on others. It would be an improvement either to refuse it wholly, or allow it daily; for all articles which strongly stimulate the blood-vessels, or excite the nervous system, if administered one day, and withheld the next, keep the whole organism in a constant state of perturbation, one day partially exhilarated and [illegible] naturally depressed. Another error is in allowing full solid diet, as meat and bread, one day, and the next restricting the diet to slop food, as soup and mush, or

mush and molasses, or both. The solid and nutritive materials, in whatever forms presented, should be nearly equa on each day. Another sad defect is the meager supply of fruits and vegetables. In most instances they seem to be regarded as *mere indulgences*, whereas they ought to be considered and provided as a substantial part of the food itself. Again, when cakes, pastry, and puddings are allowed, they are among the most unhealthful and indigestible preparations. Such an unphysiological, irregular, and disorderly plan of feeding the inmates of prisons, asylums, or pauper-houses, must be exceedingly detrimental as regards the character, health, and well-being of the individuals subjected to their punishments or charities, and as regards the discipline, order and economy in which the public are more especially interested.

Every dictate of true humanity demands, and every consideration of enlightened public policy requires, that all persons, be they wicked, poor, or homeless, be furnished with such food as will be alike conducive to healthy bodies and sound minds. Society has a right to study economy, but not to the extent of depriving a fellow-creature, under the name of authority or alms-giving, of the materials of a pure and perfect nutrition; but the expense of a perfectly wholesome dietary system would not exceed those in general use.

There are so many good things to eat in the world, and so many ways of preparing them, as taste, convenience, fancy, or economy may dictate, that our difficulty consists not in finding sufficient materials, but in making judicious selections.

The following tables are presented, not as being any better than a hundred others which could be constructed, but as landmarks to guide those who are not familiar with all the details of a dietary system founded on physiological principles.

General Dietary for a Water-Cure in Winter

Standing Articles for the Table.— Brown bread, white bread, cold cracked-wheat, hard biscuits or Graham crackers, water, milk, sugar, molasses or syrup, salt.

Monday.....*Breakfast*. Cracked-wheat mush, baked potatoes, green apples stewed.

Dinner... Beef-steak, boiled potatoes, pea-soup, apples. Dessert—Rice pudding

Supper....Indian cake, stewed prunes.

Tuesday....*Breakfast*. Rye and Indian griddle-cakes, baked potatoes, dried apples stewed.

Tuesday ....*Dinner* ...Mutton chops, mashed potatoes, boiled parsneps, baked tart apples. Dessert—Pumpkin pie.

Supper....Indian mush, dried peaches stewed.

Wednesday..*Breakfast* .Rice gruel, cold potatoes browned, green apples stewed.

Dinner ...Corned beef, potatoes, cabbage, apples. Dessert—Indian pudding.

Supper....Milk toast, boiled apples sweetened.

Thursday ...*Breakfast* .Wheat-meal griddle-cakes, baked potatoes, green apple sauce.

Dinner ...Boiled mutton, potatoes, white beans, stewed cranberries. Dessert—Apple pie.

Supper....Dry toast, dried whortleberries stewed.

Friday.....*Breakfast* .Water biscuits, boiled potatoes, dried peaches stewed.

Dinner ...Boiled halibut, sweet potatoes, beets, baked apples. Dessert—Custard.

Supper....Stewed figs, hominy.

Saturday ....*Breakfast* .Rye-meal mush, cold sweet potatoes browned, green apple sauce.

Dinner ...Roast beef, potatoes, turnips, dried currants stewed. Dessert—Tapioca pudding.

Supper....Wheat-meal sweet cake, baked apples.

Sunday .....*Breakfast* .Buckwheat griddle-cakes, dried apples and raspberries.

Dinner ...Roast beef, potatoes, Lima beans, baked tart apples. Dessert—Bread pudding, dried squash pie.

Supper....Oatmeal mush, dried apples and prunes stewed.

General Dietary for a Water-Cure in Summer.

Standing Articles—As in the preceding table.

Monday.....*Breakfast* .Indian cake, young currants stewed.

Dinner ...Roast lamb potatoes, asparagus, grapes Dessert— Tapioca pudding.

Supper....Oatmeal mush, strawberries.

Tuesday ....*Breakfast* .Rye-meal mush, red cherries.

Dinner ...Beef-steak, potatoes, green peas, stewed tomatoes. Dessert—Strawberry pies.

Supper....Dry toast, whortleberries.

Wednesday..*Breakfast*. Cracked-wheat mush, red raspberries.
Dinner...Mutton chops, potatoes, beets, string beans, uncooked tomatoes. Dessert—Rice pudding.
Supper....Water biscuits, boiled peaches.
Thursday ...*Breakfast*. Rice gruel, black raspberries.
Dinner....Corned beef, potatoes, spinach green corn, tomatoes. Dessert—Raspberry pie.
Supper....Milk toast, boiled pears.
Friday .....*Breakfast*. Rye-meal cakes, black cherries.
Dinner....Boiled cod, potatoes, succotash, baked apples. Dessert—Custard pudding.
Supper....Hominy, blackberries.
Saturday ....*Breakfast*. Boiled rice, peaches.
Dinner....Beef hash, potatoes, squash, green peas, tomatoes stewed. Dessert—Whortleberry pie.
Supper....Wheat-meal water biscuits, stewed blackberries.
Sunday .....*Breakfast*. Oatmeal cakes, stewed green apples.
Dinner....Boiled eggs or chicken, potatoes, succotash, musk-melons. Dessert—Blanc-mange.
Supper....Wheat-meal sweet cake, baked sweet apples.

I need not say that in the above tables the dry and watery foods, and the proportions of nutriment and bulk, are so arranged that the dietary for either day of the week would do as well for two or three, or even all the days of the week.

There are many cases of indigestion, attended with extreme derangement of the digestive powers, and also various chronic inflammations, complicated with great torpor of all the depurating organs, for which a more strict diet i indispensable. I propose, therefore, the following plan, which is substantially that which I have prescribed for several years.

Particular Dietary for Dyspeptics.

Breakfast...Brown bread, apples, grapes, peaches, or pears, or other very ripe uncooked fruit, if sweet or subacid. Drink—Water, or a *very little* milk.
Dinner.....Baked or boiled mealy potatoes, baked apples, or grapes, with brown bread. Dessert—Cold cracked-wheat mush, or oatmeal, or plain boiled rice, with a little

sweetened milk, or brown sugar, for seasoning; asparagus, or green peas, in their season. Drink—A very little water.

Supper.....Brown bread toasted, or Graham crackers, baked sweet apples. No drink, and the whole supper very light. Baked or boiled mealy potatoes may be substituted for the bread or crackers.

Those who reject animal food, either from principle or interest, will find so much of the dietary for Water-Cure establishments, as convenience admits or occasion requires, suitable for them, omitting the flesh part. To show, however, the amplitude of our resources for eatables, without the shedding of blood, let us look at the subject in a tabular form:

Dietary for a Vegetarian Hotel.

Standing Articles.—Brown bread, white bread, rye and Indian bread, butter, pot cheese or fresh curd, sweet cream, milk, water, lemon juice, sugar, syrup or molasses, or honey.

Monday.....*Breakfast*. Wheat and Indian griddle-cakes, rice gruel, baked potatoes, stewed green apples.

Dinner....Mashed boiled potatoes, parsneps, squash, green corn, apples, grapes. Dessert—Rice pudding, custard pie.

Supper....Milk toast, cracked-wheat mush, potatoes, baked apples, stewed figs, blanc-mange.

Tuesday...*Breakfast*. Corn-meal cake, boiled potatoes, stewed peaches, stewed currants.

Dinner....Potatoes, white beans boiled, beets, tomatoes, musk-melons. Dessert—Tapioca pudding, pumpkin pie.

Supper....Dry toast, plain sweet cake, hominy, potatoes, whortleberries, stewed apples.

Wednesday..*Breakfast*. Rice griddle-cakes, wheaten grits, cold boiled potatoes browned.

Dinner....Sweet potatoes, asparagus, cabbage, green peas, tomatoes, green pears, baked apples. Dessert—Custard pudding, apple pie.

Supper....Cracker toast, Indian mush, potatoes, stewed prunes, stewed dried peaches.

Thursday...*Breakfast*. Graham flour hoe-cake, baked potatoes strawberries, apples.

Thursday ... *Dinner*.... Mashed potatoes, baked carrots, spinach, baked white beans, sweet oranges, baked apples, grapes. Dessert—Indian pudding, tomato pie.

Supper.... Oatmeal mush, brown biscuits, potatoes, custard, boiled apples, peaches, or pears.

Friday ..... *Breakfast*. Buckwheat griddle-cakes, baked potatoes, stewed apples, grapes, cherries.

Dinner.... Common potatoes, sweet potatoes, green corn, string beans, baked apples, stewed tomatoes. Dessert—Cracked-wheat pudding, whortleberry pie.

Supper.... Rice gruel, dry toast, potatoes, boiled peaches or pears.

Saturday .... *Breakfast*. Wheat-meal water biscuits, baked potatoes, oranges, figs, bananas, or grapes.

Dinner.... Potatoes, pea-soup, parsneps, boiled cabbage, baked sweet apples. Dessert—Boiled rice, dried apple and green currant pie.

Supper.... Oatmeal cake, cracker toast, potatoes, stewed apples.

Sunday ..... *Breakfast*. Rye-meal griddle-cakes, farina mush, potatoes, boiled peaches, pears, or apples.

Dinner.... Sweet potatoes, common potatoes, turnips, asparagus, stewed tomatoes, baked apples. Dessert—Blanc-mange, pumpkin or squash pie.

Supper.... Plain biscuits or buns, cold hominy, potatoes, green apples stewed.

The dietary for a private family only requires a little simplification in the matter of variety; there is as much room for improvement in this direction as any one is disposed to occupy. Those who see fit to drop off the superfluities or seasonings—salt, butter, cream, etc.—will experience, in due time, a permanent physiological advantage, amply compensating them for the temporary privation of accustomed indulgences. But let me in this place urge what I have before insisted upon, and what is of vastly more importance to invalids, and even to well persons. than most people can be made to understand, that all seasonings or condiments, and especially butter and salt, are incomparably less injurious when added to the article of food after it is cooked, than when cooked into it. The sweetness, digestibility, and healthful-

ness of most of our ordinary vegetables, I repeat, are always very materially impaired by cooking them in salted and greasy water. This is one of the *great errors* of most Water-Cure establishments, which easily can be and ought to be corrected. Let those whose appetites or whose judgments are determined in the employment of these things, put them *on*, not cook them *in*, their vegetable dishes or farinaceous preparations.

The following catalogue of green fruits and vegetables as found in the New York markets, exhibits our ample resources for these articles during each month of the year. The list is a selection of the best articles in their seasons, rather than an enumeration of the whole:

January.—Common potatoes, sweet potatoes, beets, cabbages, white turnips, yellow turnips, preserved green peas, preserved green Lima beans, pumpkins, apples, grapes.

February.—Common potatoes, sweet potatoes, parsneps, beets, cabbages, white turnips, yellow turnips, preserved green peas, preserved Lima beans, apples, grapes.

March.—Common potatoes, sweet potatoes, parsneps, beets, cabbages, white turnips, yellow turnips, preserved green peas, preserved green Lima beans, apples, grapes.

April.—Common potatoes, parsneps, beets, carrots, cabbages, white turnips, yellow turnips, preserved Lima beans, spinach, apples, grapes.

May.—Common potatoes, parsneps, beets, carrots, cabbages, asparagus, spinach, apples, currants, strawberries.

June.—Common potatoes, parsneps, cabbages, asparagus, spinach of various kinds, strawberries, currants, peas, string beans, cherries, gooseberries, apples.

July.—Common potatoes, sweet potatoes, peas, beans, young corn, beets, squashes, strawberries, currants, gooseberries, whortleberries, cherries, raspberries, tomatoes, apples, peaches, apricots, water-melons, musk-melons.

August.—Common potatoes, sweet potatoes, peas, beans, young corn, squashes, currants, raspberries, whortleberries, blackberries, tomatoes, apples, peaches, pears, apricots, water-melons, musk-melons, plums, grapes.

September.—Common potatoes, sweet potatoes, beans, young corn, cabbages, beets, turnips, tomatoes, blackberries, apples, peaches, pears, water-melons, musk-melons, plums, grapes, pumpkins.

October.—Common potatoes, sweet potatoes, beets, turnips, cabbages, squashes, pumpkins, apples, pears, plums, grapes.

November.—Common potatoes, sweet potatoes, beets, turnips, pumpkins, squashes, cabbages, apples, pears, plums, grapes.

December.—Common potatoes, sweet potatoes, beets, turnips, preserved green peas, preserved Lima beans, squashes, pumpkins, apples, grapes.

I cannot, perhaps, better conclude the dietetic department of this work, than by quoting the testimony of two eminent medical scholars and accurate observers, in favor of vegetable diet both as a curative and preventive of disease. The first-named author practiced in his person and prescribed to his patients what he preached; the latter did neither.

Dr. William Lambe *(Water and Vegetable Diet in Consumption, Scrofula, Cancer, Asthma, etc.)* remarks: "It seems, moreover, highly probable that the inherent power of the living body of restoring itself under accident or wounds, is strongest in those who use mostly a vegetable regimen, and who are very sparing in the use of fermented liquors. This has been observed among the Eastern nations. Sir George Staunton says on this subject: 'It is, however, to be remarked that the Chinese recover from all kinds of accidents more rapidly, and with fewer symptoms of any kind of danger, than most people in Europe. The constant and quick recovery from considerable and alarming wounds has been observed likewise to take place among the natives of Hindostan. The European surgeons have been surprised at the easy cure of sepoys in the English service, from accidents accounted extremely formidable.'" This felicity the relator attributes to the causes which I have mentioned. I have received the same accounts from other quarters.

These facts are enough to induce a suspicion that our diseases are much exasperated by our manner of living, and the full diet of animal food to which we are habituated. One would be apt to imagine, from the common practice of most of our physicians, and still more of our medico-chirurgeons, that excess and intemperance were the regular methods of curing diseases. They have been laboring, during almost the whole of my medical life, to prove to the public that the doctrines of abstemiousness, inculcated by several of our predecessors, are a mere prejudice and error. In almost all chronic diseases, to forbid the use of vegetables is a part of the established routine. If there be a little heart-burn or flatulency, all vegetables are instantly proscribed. Infants, even, are loaded with made dishes, and their breaths smell of wine and strong liquors. Nay, to such an extent are these abominations carried, that when their stomachs revolt against these unnatural compounds, with instinctive horror, and the importunities of nature cannot be wholly resisted, a little fruit is held out to them as a sort of premium, and as a reward for forcing down the nauseous farrago which they loathe.

The English surgeon, John A. Forsyth, somewhat celebrated as an author on medical and dietetical subjects, and a very accurate historical writer, observes, in allusion to the connection between the vegetarian food and the health of the early inhabitants of the earth (*Dictionary of Diet*): "The decays of nature, in the expiring periods of life, were the only infirmities to which men were then liable; and though their limbs sometimes failed to perform their office, their health and appetite continued with them till life was no more. In this rude, but natural state, the food of mankind is said to have continued upward of two thousand years, *during which period the cook and the physician were equally unknown.* It is not easy to say at what period man exchanged vegetable for animal diet; but certain it is, that he no sooner began to feed on flesh, fowl, and fish, than seasonings of some kind became requisite, not only to render such food more pleasing and palatable, but also to help digestion and prevent putrefaction. Of these seasonings, salt was probably the first discovered; though some are inclined to think that savory roots and herbs were first in use; spices, however, as ginger, cinnamon, pepper, cloves, and nutmegs, by degrees came into use, and the whole art of cookery gradually improved, till it reached its present climax of perfection. Eating of animal food was evidently adopted as necessary to guard against famine, the consequence of the scarcity and bad condition of vegetable productions. We find, therefore, that in process of time, and to aid their mutual wants, as well as to protect the weak against the strong, the industrious from the indolent, men, by general consent, began to portion out to each other a certain measure of land, to produce them their supply of vegetables. Reason soon after suggested the expedient of domesticating certain animals, equally to assist them in their labors and to supply them with food. Hogs, it is said, were the first animals of the domestic kind that appeared on their tables, as then they held it to be ungrateful to devour the beasts that assisted them in their labors."

GLOSSARY.

In the following vocabulary will be found a definition of the most important technical terms, not fully explained in the text:

Abnormal, irregular, unnatural.
Acetabulum, saucer-like cavity.
Acute, of short duration, severe.
Adipose, fatty; from *adeps*, fat.
Adynamic, relating to vital debility.
Aëration, arterialization of the blood.
Allopathy, "contraria contrarius curantur," or, the practice of counteracting the symptoms.
Anæsthesia, deprivation of sensibility.
Anastomosis, communication between vessels.
Anhæmia, bloodlessness, with debility.
Anorexia, absence of appetite.
Antiphlogistic, reducing, cooling.
Ant-irritant, soothing, sedative.
Apparatus, set of organs or instruments.
Areolar tissue, cellular substance.
Arterial, relating to arteries.
Articular, relating to joints.
Asphyxia, suspended animation.
Atheroma, pulpous encysted tumor.
Atony, want of tone, debility.
Atrimatrics, medication with foul air
Basilir, pertaining to the base.
Biceps, a two-headed muscle.
Bicuspids, two-pointed teeth.
Bougie, a flexible dilating tube.
Brachial, belonging to the arm.
Bronchia, branches of the windpipe.
Bursæ mucosa, sacs of viscid fluid.
Calculi, concretions of gravel, stone, etc.
Capillary, small, minute, hair-like.
Cardiac, relating to the heart.
Catamenial, relating to the menses.
Cephalagia, headache of any kind.
Cervical, relating to the neck.
Cervix uteri, neck of the uterus.
Chronic, of long and uncertain duration.
Chylopoietic, chyle-making organs.
Cicatrix—Cicatrization, a scar—scarring.
Cineritious, cortical, ash-colored.
Colliquative, profuse, exhausting discharges
Commissures, points of union between parts
Condyle, an articular eminence of bone.
Contractility, the vital property of muscle.
Convolutions, undulating windings.
Corpuscules, the globules of various fluids.
Cortical, exterior, belonging to the bark.
Cuticle, the epidermis, or scarf-skin.
Cutis vera, the inner or true skin.
Demulcent, gummy, mucilaginous medicines.
Dermoid, pertaining to the integument.
Diaphoretic, tending to produce sweat.
Diluent, tending to thin the fluids.
Dispensatory, book of medical compositions
Diuretic, increasing the urinary secretion.
Dorsal, pertaining to the back.
Dynamic, in biology, the vital force.
Eclectic, selecting from all sources.
Effluvia, impalpable emanations.
Elasticity, property of areolar tissue.
Elingual, destitute of a tongue.
Elixir vitæ, alcohol and aromatics.
Emmenagogue, promoting menstruation.
Emollient, softening, relaxing, soothing.
Encephalic, situate within the head.
Endemic, prevailing over a neighborhood
Epidemic, prevailing over a country.
Epidermis, the external or scarf-skin.
Epigastric, upon or near the stomach.

Epiploon, the caul or omentum.
Epispastic, blistering the skin.
Episynthetic, accumulative, collective.
Epithem, soft or warm applications.
Eructation, sonorous ejection of wind.
Escharotic, producing a sore or scar.
Expiration, breathing *from* the lungs.
Facette, small, smooth surface of bone.
Facial, belonging to the face.
Fasciculus, a small bundle.
Fæces, excrement of the bowels
Fauces, the throat, pharynx.
Feculent, relating to the fæces.
Fenestra, window-like.
Filament, a fine thread, fibril.
Foramen—Foramina, a hole—apertures.
Fossa—æ, a depression—cavities.
Frænum, a bridle of fibers
Fumigations, odorous smokes or gases.
Ganglia, convolutions of nervous cords.
Gangrene, death, with putrefaction.
Gastric, relating to the stomach.
Gastrodynia, flatulent colic.
Gastro-enteric, relating to the stomach and bowels.
Glenoid, shallow articular cavity.
Granulations, flesh-shoots of ulcers.
Granule, a small, compact particle.
Grumous, clotted or coagulated.
Gymnastic, relating to bodily exercise.
Hepatic, pertaining to the liver.
Homœopathy, "similia similibus curantur," the doctrine that like cures similar.
Humoral pathology, the doctrine of the fluids being the primary seat of disease.
Hydropathy, hygienic medicine, the system of treating diseases by water, light, air, temperature, exercise, food, etc.
Hygiene, preservation of health.
Hypoglossal, under the tongue.
Idiopathic, primary, original.
Idiosyncrasy, functional peculiarity.
Ingesta, food, drinks, condiments, etc.
Inhalation, breathing into the lungs.
Innominata, nameless, bones of the pelvis.
Inorganic, without distinct organs.
Inosculation, connection, communication.
Inspiration, receiving air in the lungs.
Insufflation, injecting gases or vapors.
Intumescence, enlargement, swelling.
Irritability, susceptibility to external impressions; the ultimate vital property.
Irritant, causing painful excitement.
Irritation, preternatural excitement
Lachrymal, relating to the tears.
Lamella—æ, thin plate or plates.
Lamina—æ, thin part or parts of bone.
Lentor, viscid or sizy matter.
Lithontriptic, solvent for the stone.
Lobe, small, round, projecting part.
Lobule, diminutive of lobe.
Lumbar, relating to the loins.
Malaria, miasm, noxious gases.
Malignant, dangerous or putrescent.
Mater, mother, membranes.
Materia Medica, medical materials.
Meatus, a canal or passage.
Medulla, the marrow or pith.
Medullary, relating to the marrow.
Membranous, formed of membrane.
Menstruum, a vehicle or solvent.
Metastasis, changing the seat of disease.
Metasyncrisis, changing, making over.
Methodus Medendi, curative method.
Modus operandi, mode of operating.
Molecular, relating to minute portions.
Mucous, pertaining to mucus.
Mucus, animal mucilage.
Narcotic, stupefying, deadening.
Nervine, relating to articles which affect peculiarly the nervous system, either of an exciting or soothing nature.
Neutral salts, salts having excess of neither acid nor alkali.
Neuralgia, nerve-ache, tic dolereaux.
Normal, regular, natural.
Nosology, classification of diseases.
Nuclei—Nucleoli, central points, or primordial particles of matter.
Ophthalmia, inflammation of the eye.
Organic, constituted of organs.
Osseous, relating to bone.
Ova—Ovules, germinal particles, eggs.
Papillæ, nipple-like eminences.
Parenchyma, substance of the lungs.
Parietal, relating to a side or wall.
Pathogenetic, disease-producing.
Pathology, doctrine of diseases.
Petrous, hard, resembling stone.
Pharmaceutic, relating to pharmacy.
Pharmacopœia, book of medical formularies
Pharmacy, preparation of drug-medicine.
Phlegmasia, term for inflammation.
Phlogistic, active inflammation.
Plastic, that which serves to form.
Plexus, net-work of vessels or nerves
Pneumatology, in medicine, the doctrine of spiritual substances.
Præcordia, near the heart, or about the epigastric region.

Preternatural, unnatural.
Process, in anatomy a projection.
Probang, a rod of whalebone.
Prophylactic, preventing disease.
Puerperal, relating to childbirth.
Radicles, germs of the roots.
Regimen, regulated food, drink, etc.
Refrigerant, cooling, reducing.
Renal, relating to the kidneys.
Respiration, pertaining to breathing.
Resolution, removal of disease.
Rubefacient, inflaming the skin.
Rugæ, membranous folds or wrinkles.
Sacral, relating to the os sacrum.
Sedative, soothing, anti-irritant.
Semi-animist, half-living and half-dead.
Sensation, cognizance of an impression.
Sensibility, feeling of an impression.
Sero-fibrous, serous and fibrous.
Serous, thin, watery, like serum.
Sialagogue, exciting the salivary flow.
Sigmoid, resembling the Greek S or C.
Speculum, an instrument to dilate cavities, etc.
Spermatozoa, spermatic animalcules.
Stimulant, exciting the circulation.
Spinous, sharp or thorn-like.
Sudorific, producing perspiration.
Suppuration, formation of pus.
Sympathetic, associated in function, action, or condition.
Symptomatic, secondarily affected.
System, assemblage of parts or organs.
Temperament, constitutional peculiarity.
Temporal, relating to the temple.
Tenesmus, frequent, painful, and vain attempts to eject from the bowels.
Therapeutics, the application of remedies
Tic dolereaux, nerve-ache, neuralgia.
Tissue, a distinct structure.
Tone, force, power, stamina.
Tonic, giving strength, corroborant.
Tormina, griping pains in the bowels.
Traction, gradual, steady pulling.
Transpiration, passage of fluid outward.
Tubercle, a tumor within an organ.
Tuberosity, protuberance, projection.
Turgescence, swelling, fullness.
Vascular, composed of vessels.
Venæsection, bleeding with a lancet.
Venous, appertaining to veins.
Ventricular, relating to small cavities.
Vermifuge, a remedy against worms.
Vesicular, consisting of vascular cells
Vesicatory, producing blisters.
Villous, hair-like, velvety.
Vis Medicatrix Naturæ, remedial power of nature.
Viscus—Viscera, organ—organs.
Vitality inherent principle of life.
Vis vitæ, vital force, irritability.

THE

HYDROPATHIC ENCYCLOPEDIA:

A SYSTEM OF

HYDROPATHY AND HYGIENE

In Eight Parts:

I. OUTLINE OF ANATOMY, ILLUSTRATED.
II. PHYSIOLOGY OF THE HUMAN BODY.
III. HYGIENIC AGENCIES AND THE PRESERVATION OF HEALTH.
IV. DIETETIC AND HYDROPATHIC COOKERY.
V. THEORY AND PRACTICE OF WATER-TREATMENT.
VI. SPECIAL PATHOLOGY AND HYDRO-THERAPEUTICS, INCLUDING THE NATURE, CAUSES, SYMPTOMS, AND TREATMENT OF ALL KNOWN DISEASES.
VII. APPLICATION TO SURGICAL DISEASES.
VIII. APPLICATION OF HYDROPATHY TO MIDWIFERY AND THE NURSERY.

DESIGNED AS

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BY R. T. TRALL, M.D.

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HYDROPATHIC ENCYCLOPEDIA

PART V.

THEORY AND PRACTICE.

CHAPTER I.

PHILOSOPHY OF WATER-CURE.

RELATIONS OF WATER TO THE HEALTHY ORGANISM.—Before we can clearly comprehend the remedial relations of pure water to the morbid conditions of the body, we must understand its physiological or vital relations to the healthy organism. These may be stated most succinctly, and remembered most easily, in the form of distinct propositions.

1. Water constitutes the greater proportion of the entire bulk of the body.

2. Water composes more than three fourths of the whole mass of blood; more than seven eighths of the substance of the brain, and more than nine tenths of the various colorless fluids and secretions.

3. Water is the only vehicle by which nutrient matters are conveyed to the blood, and through the blood to all parts of the system for its growth and replenishment.

4. Water is the only medium through which waste or effete particles, or extraneous ingredients, are conveyed from all parts of the system to the excretory organs to be expelled.

5. Water is the only solvent, diluent, and detergent in existence, for animal and vegetable alimentary and excrementitious matters.

6. Water is the only material capable of circulating in all the tissues of the body, and penetrating their finest vessels, without vital irritation or mechanical injury.

7 The only morbid effects of water result from improper tempera-

ture, and over-distension of the hollow viscera, or circulating vessels from excess of quantity—effects never necessarily unavoidable.

Modus Operandi of Water.—Contrary to the teachings of the standard medical books of allopathic, homeopathic, and eclectic schools, we must ever bear in mind that disease is never a *positive entity*, but always a *negative quality;* it is the absence of health, or of the state, circumstances, and actions which constitute that balance of functional duty we call health. By referring to the misuse or abuse of some one or more of the hygienic agencies, we find the *cause* or *causes* of those deviations from the *normal* state, which constitute the abnormal state, and which we call disease; and now, by applying the above propositions to the causes which produce and the conditions which constitute disease, we will find the true grounds which indicate and demonstrate water to be a remedy of general, and even universal application.

In a general sense, diseases are produced by bad air, improper light, impure food and drink, excessive or defective alimentation, indolence or over-exertion, unregulated passions, in three words—unphysiological voluntary habits. The conditions of the body in disease—the *proximate causes* against which all remedial efforts are to be directed—are, in general terms, impure blood, unhealthy secretions, obstructions in the minute vascular structures, or capillary vessels, excessive action in some parts or organs, with deficient action in others, unequal temperature, etc., in other words, a *loss* of balance in the circulation and action of the various parts of the vital machinery, producing great discord in some portion of it, and more or less disorder in all. The general indications are, therefore, to remove obstructions, wash away impurities, supply healthful nutriment, regulate temperature, relax intensive and intensify torpid action, etc.; and what like water, what *but* water, with its concomitants, air, light, food, temperature, etc., can answer to these indications?

To say that medicinal drugs can answer these indications is sheer nonsense. They may respond to any other indications almost that can be named; but these, *never.* They may change the issue, they may suppress a symptom, remove a pain, transfer an irritation, excite a new vital resistance, produce *another* obstruction, and so divide the organic struggle between two points, diminish vital power, or increase vital expenditure; but none of these impressions or effects are really remedial, none of them meet the indications; and if physicians in general, and mankind in particular, are not satisfied with the experiments of three thousand years, which, by the way, have destroyed ten times as many of the human family as they have saved, let them by all means *be satisfied*, even if they have to go on in the same absurd

blundering, and senseless, though very learned and scientific business, of drugging and killing, marring and scarring, for three thousand years longer.

Water, according to the mode of application, can intensify or moderate any function; it can energize or abate any given action; it can be made to increase or diminish temperature, locally or generally, to any extent desired; hence, though not a universal cure—for diseases are not universally curable—it is a remedy universally applicable. But while water, judiciously managed, may be doing its appropriate work in alleviating or curing disease, other causes may counteract, retard, or entirely prevent the consummation of any curative process. The patient may live badly in other respects; something in his eating, or drinking, or sleeping, or exercising, or other voluntary habits, may be wrong, and constantly re-supply the causes of disease as fast or faster than the best remedial use of water can remove or overcome them; therefore, though water is put prominently forward in the hydropathic system as in all cases the *great panacea*, it must ever be recollected that it is but one of several remedial agencies whose influence is equally to be regarded in preserving health or in curing diseases.

To illustrate: Of fifty or a hundred invalids at a hydropathic institution, while all may employ water in the way of bathing in the best possible manner, one half of them will pretty certainly hold on to some unhealthful habit which retards or prevents the cure, or renders it imperfect. One will nibble on candies or fruits between meals; some in the cities will lunch on oysters or plum-pudding; some will eat flesh immoderately; others will persist in the use of butter or greasy meats sufficiently to keep them constantly bilious; others will take salt enough to keep the whole body pickled, as it were, in an acrid brine; others will eat an undue proportion of fine flour, and keep the bowels all the while constipated; others will endeavor to make up by the "stimulus of distension" for the lack of mustard, vinegar, and pepper; others will drink tea or coffee, chew tobacco, or smoke cigars occasionally; and yet others will indulge in a dose or two of drugs now and then, stealthily, of course; and so on to the end of the chapter of "errors in Water-Cure." It is true all these things are ruled out of the establishments, but they are, notwithstanding, very frequently practiced by many patients; and what is particularly vexatious, ungrateful, and perverse, all the evil consequences of their bad habit are usually imputed to the Water-Cure!

It may be said that the physician ought to manage all these matters, and make all patients conform in all respects to a physiological regimen. This is not always possible, for with many invalids habit is much

stronger than reason, and with some dyspeptics the craving of the morbid appetite for its disease-producing aliments, and condiments and narcotics, is not a whit more governable than is the drunkard's appetite for those intoxicating poisons which have produced his insatiate craving. Both kinds of appetite are controlled, and finally overcome by a few; but sad experience tells the story that the majority are conquered and destroyed by them.

In accounting for the therapeutic operation of particular processes of the water-treatment, we must never forget that Nature is the true physician. The restorative power is inherent in the living organism. All that the true healing art can do is to supply favorable conditions, remove extraneous materials, and regulate hygienic influences, and thus place the system as fully as possible under organic law.

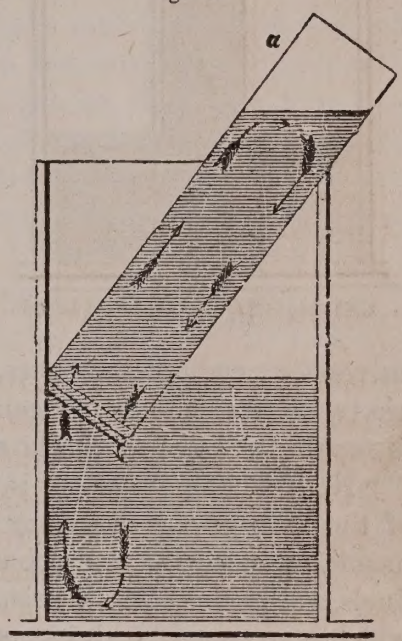
The humoral pathologists impute all diseases to a *lentor*, or morbific matter in the blood; while the solidists and vitalists contend that the *action of the solids*—being too much increased or diminished—is the proximate cause of all diseases. The former bleed, leech, scarify, blister, sweat, puke, purge, stimulate, and antiphlogisticate; and the latter bleed, leech, scarify, blister, sweat, puke, purge, stimulate, and antiphlogisticate too! Here is diversity of cause producing identity of effect; a postulate not dreamed of in natural philosophy.

We may apply water to the treatment of disease, on either theory, much more rationally than the allopath can his drugs and depletives. Whichever theory we adopt—and both are correct to a certain extent—we can alter, depurate, change, increase, restrain, or modify the fluids and actions with water and regimen, as well as with lancets and drugs, and with none of their necessary evils or ever-present dangers. We can even get minerals, chemicals, and other drug-medicines out of the body by means of water-treatment, whereas the *ne plus ultra* of drug medical science consists in getting the system full of them, and then abandoning it to its fate, and "the efforts of nature."

It is no uncommon circumstance for patients to become severely salivated during water-treatment. I have treated several cases wherein patients who had taken no mercury for several years, experienced all the symptoms of a "mercurial course," such as tender, fleecy gums, metallic taste, fetid breath, swelled tongue, and copious drooling. Other mineral poisons also produce great constitutional or local disturbance during the process by which they are expelled from the body. These drugs, as already intimated, all the other drugs in creation have no power to remove from the body. They may, like acids and alkalies, silence each other's specific action, or combine to produce a different action; but they do not and cannot drive each other out of the system

The manner in which water purifies the body from mercury and other mineral poisons, *alias* medicines, affords an explanation of its mode of action in a great variety of morbid conditions. Referring to the laws of *endosmose* and *exosmose*, as explained in the physiological part of this work, we find that when animal membranes, living or dead, and whether connected to or separated from the body, have their opposite surfaces in contact with dissimilar fluids, an interchange takes place, which is continued until the constituents of both fluids become exactly similar, when all action between them ceases. Dr. E. Johnson *(Domestic Hydropathy)* has constructed the following diagrams, which very well illustrate this subject:

Fig. 162.



ENDOSMOSE AND EXOSMOSE.

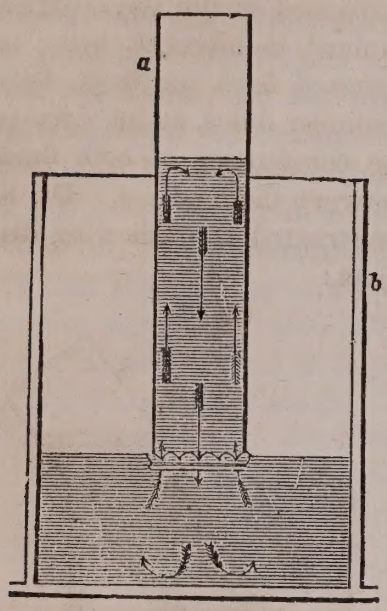
In fig. 162 *a* is a glass tube, the diameter of whose caliber is four tenths of an inch. Close one of its ends accurately with a piece of bladder, and fill the tube with brine. Now take a much larger tube (*b*)—a common tumbler will do—and fill it three quarters full with pure water. Then immerse the bladder-end of the small tube just under the surface of the water of the larger tube or tumbler, giving it an inclination of about 45°. In a short time a current of liquid will be seen rising from the bottom of the water in the tumbler, upward along its side, in the direction indicated by the arrows, through the bladder, and up along one side of the small tube to the surface of the brine; then it descends along the other side of the small tube, in the direction of the arrows on that side, down through the brine, and through the bladder, down to the bottom of the water. The downward current is a current of brine descending into the water in the tumbler. The upward current is a current of pure water ascending into the tube to supply the place of the lost brine; and this current will continue until the two fluids have become similar, that is, until the fluid in the basin has become as salt as that contained in the tube.

"If now the tumbler be emptied, and refilled with pure water, the current will be re-established, and in this way the brine in the tube may be completely purified of its salt.

"The currents will be seen with beautiful distinctness if some very

fine particles of indigo be suspended in both fluids—that in the tumbler, and that in the tube

Fig. 163.



ENDOSMOSE AND EXOSMOSE.

"If the tube *a*, in fig. 163, which contains the brine, have a caliber whose diameter is four fifths of an inch, and if it be supported vertically, so that the bladder-end be immersed just below the surface of the water in the tumbler (*b*), two currents will be seen to ascend, in the direction of the arrows, through the bladder, one on either side of the tube, to near the surface of the brine. They now turn, and descend together in a double current through the middle of the brine in the tube, down through the bladder into the water, where they diverge, turn again, and again ascend. The double current descending through the middle of the tube is a current of brine coming down into the water in the tumbler. The two separate outer currents ascending from near the bottom of the water in the tumbler, are two currents of water going up through the bladder into the tube, to supply the place of the brine which has descended into the water.

"Now when pure water is held in contact with the external surface of the skin of the body, by means of the wet sheet, or any other means, precisely the same conditions are established with regard to the fluids within the body, that is, on the inside of the skin, and the water which is in contact with its outer surface, as are established in fig. 163, between the fluid (brine) contained in the tube, that is, on the inside of the bladder, and the water in the tumbler, which is in contact with the bladder's outer surface. About eighty per cent. of the blood is water, and it is this water which holds in solution whatever soluble substances, whether poisonous or otherwise, happen to be present in the blood; and it is this water, holding in solution fibrin, albumen, and the various salts proper to the blood, which alone circulates in those myriads of millions of millions of capillary vessels which are too small to admit the red particles. When any poisonous matters are present in the blood, it is in this water of the blood that they are held in solution, as the salt is held in solution in the water of the brine.

"Now when by means of the wet sheet, pure water is held in contact with the outer surface of the skin, and supposing that the water

of the blood, which is on the inside of it, is poisoned, say with bichloride of mercury, what happens is this: An interchange takes place between the fluid on the outside (pure water) and the fluid on the inside, viz., the water of the blood holding bichloride of mercury in solution. The mercury-and-water passes through the skin into the water of the wet sheet, while the pure water of the wet sheet passes through the skin into the blood to supply the place of the mercury-and-water. As in figures 162 and 163, a double current is established; a current of pure water into the body, and a current of mercury-and-water out of the body; and in this way, by frequently renewing the external contact of pure water with the skin, the blood is purified of whatever poisonous or otherwise morbid matters it may happen to contain.

"If a glass tube be partially filled with a saturated solution of salt (brine), one end of the tube having been first carefully tied over with bladder, and if the tube be suspended in the air, in a short time that side of the bladder which is exposed to the air becomes covered with salt. The brine passes through the bladder from the inner to the outer surface. When it reaches the outer surface the water evaporates, leaving the salt adhering to the bladder.

"When a person has taken the nitrate of silver for a considerable length of time, it is well known that the skin becomes colored permanently blue, from the lodgment of oxide of silver in the tissue of the skin, the nitrate being converted into a simple oxide.

"It would seem that something similar happens here with regard to the salt of silver (nitrate of silver) and the skin, as happens with regard to the salt of the brine and the bladder, in the experiment just described above. The water of the blood, holding the nitrate of silver in solution, passes through the under layers of the skin until it reaches the rete mucosum, which lies immediately under the scarf-skin, not traveling along the perspiratory spiracles, but permeating the tissues. Having reached this locality, the water of the blood evaporates, while the silver, unable to penetrate the dry and horny cuticle, is left fixed in the rete mucosum."

Similar experiments may be tried, with similar results, with any of the soluble metallic, mineral, or earthy salts, as of arsenic, iodine, sulphate of potassa, etc. I have known mercurial ulcers take place during water-treatment, on the lower extremities of patients whose bodies had, years previously, been thoroughly mercurialized, and which it was impossible to heal until after the body had become entirely cleansed of the mineral by several months' treatment.

WATER-TREATMENT AND DRUG-TREATMENT CONTRASTED.—The

above facts amply demonstrate the superiority as well as the more rational philosophy of the water-treatment over the drug-treatment on the humoral theory. But the vitalists have much to say about "dynamic forces." With them every thing goes by *impression*, or *stimuli*. Disease is produced by morbid *impressions* on the brain, or nervous system, which impressions are conveyed to the various organs or parts of the body by nervous distribution, or functional sympathy; and remedies operate by electric, magnetic, stimulant, alterant, or some other forceful property which makes *impressions* on the nervous centers, and these *impressions* are thence radiated through the system, and counteract, overcome, subdue, or in some other most mysterious and utterly inexplicable manner, cure disease, or, perchance, by some unfortunate and unaccountable circumstance or accident, render it worse.

But there is something of matter-of-fact in this theory, as, indeed, there is in nearly all the vagaries which have ever possessed men's minds. We know that mental impressions do disturb or modify, arrest or energize either and all of the functions of the body, and these impressions may be morbid or sanatory; they may produce disease or remove it. But on this principle of physiological impressibility, is there not a better way of exciting counteracting morbid impressions than by drawing off the vital current, or poisoning the body through and through with pernicious drugs? Common sense replies in the affirmative, and all rational minds, unbiased by a miseducation, would respond, "there *must* be a better way." And here our "universal panacea," pure soft water, supplies the desideratum. On the theory of impressibility it is just what is desirable, and all that is requisite, if suitably aided by the other hygienic adjuvants. All the impressions made on the living body can only affect its functions as they produce or arrest action or motion, which action or motion is muscular contrac tion. Cold water and ice are assuredly the most powerful constringing agents that can be applied to the living structures without destruction or injury; and hot water, or steam, is the most efficient relaxant that can be safely employed. For producing moderate contraction or relaxation, we have all degrees of temperature between the freezing and the boiling points.

The remedial effects of water, thus far considered, are a complete substitute for all the depletory processes of the regular system, as *bleeding*, *leeching*, *antimonializing* and *refrigerating*, and all the classes of medicines called *emetics*, *cathartics*, *diaphoretics*, *diuretics*, *alteratives*, *tonics*, and *stimulants*. But there are other classes which are called *narcotics*, *nervines*, and *sedatives*, to which opium, camphor, ether, musk, castor, henbane, ratsbane, dogsbane, wolfsbane, and divers

ther *bares* belong, which at first view seem more difficult to dispense with. There is something like a charm in the idea of sending down the the sick person's throat a dose which silences his pains and quiets his distress with magical celerity. But the charm is at once dispelled when we look to ultimate consequences. The very pain which the potent and ill-advised dose of the doctor has subdued is generally the warning voice of the organic instincts that something is wrong, or the effort of the organism to rid itself of an enemy. When the organic instincts proclaim to the whole domain of life, through the medium of the brain, that an enemy is present, that proclamation is *felt*, not heard, *and its language is pain.* It is one thing to silence the outcry of nature for help, but it is quite another thing to relieve her by dislodging the enemy. The first may often be done by narcotics and stimulants; the second can be accomplished by the use of water. In fact, water will often succeed in promptly removing pain which the most powerful narcotics fail to mitigate. There may be inflammation, obstruction, engorgement, distension or contraction, the pain of which all the opium that can be taken short of deathful doses will not alleviate, and yet water of some temperature and in some form of application will relieve at once.

There are also classes of medicines called *acids*, *alkalies*, *anthelmintics*, *lithontriptics*, *demulcents*, etc. How, it may be asked, is water to substitute them? Simply by obviating the occasion for them. A patient has a sour stomach, and the doctor gives him soda; another is afflicted with worms, and the doctor administers something to poison them to death; another has gravelly concretions, and the doctor advises chemical solvents; another has acrid bile which corrodes his throat, and the doctor prescribes lubricating mucilages, and so on to the end of life. But who cannot perceive that all this practice, as a part of the *healing* art, is absurd and ridiculous? Who so stupidly blind as not to see that it is a mere patch-work, tinkering at effects without removing causes? The water-treatment corrects the *condition* upon which the existence of these abnormal symptoms depend, when of necessity they all disappear.

In the works of the popular system we read much about "accelerating the change of matter," in order to renovate the tissues and reinvigorate the functions. To do this it is recommended to bleed, purge, and mercurialize the patient down, and then, *presto!* wine, tonics, and "generous diet," to stimulate him up again as fast as possible, thus doing and undoing interchangeably. Bathing, with appropriate air and exercise, and plain simple food, will effect a change of matter incomparably more rapid, and without the destruction of healthful material

or the injurious "dynamic force" of alcoholic poison. If there is surplus matter about or within the body, water will wash it away, and if there is a deficiency of organic material, pure food and good digestion are the natural means to supply it.

Again, the water-treatment, by regarding the skin as the leading depurating function of the body, follows out the indications of nature herself, which expels the greatest amount of morbific agents, whether miasms, effete organic matters, or drugs and medicines, from the body through the cutaneous channels. Instead of wearing out the alimentary canal, where but a small quantity, comparatively, of waste or offensive matter is ever found, with horridly poisonous emetics and bowel-scraping cathartics, the principal detergent process is directed to the skin, where naturally five or six times the amount of excrementitious matters are got rid of, that is, thrown off by the bowels.

There is a principle recognized in the allopathic school, called *counter-irritation* or *antagonism*. Indeed, some late authors have gone so far as to consider it the fundamental principle of the whole drug and depleting system. It is based on the supposed law of the animal economy, that nature, or the vital powers, cannot maintain two different kinds of morbid action in different parts of the body at the same time. Thus, if a man has an inflammation of the stomach and bowels, and you produce a severer inflammation of the mouth and salivary glands with calomel, the stronger mercurial excitement will absorb, as it were, the lesser inflammatory action; the latter will then get well, after which the doctor may cure the drug-disease he has produced—the salivation—if he can. Such practice has no claim to the title of *healing art;* it is doing an irreparable injury, with the ulterior possibility of a greater good. *Blisters*, *issues*, *escharotics*, and the endless compounds in the shape of *irritating ointments* and *stimulating liniments* are predicated on no better philosophy than that of removing one evil by producing another.

But admitting the fact that one disease does antagonize, or neutralize, or supercede another, the usual explanation is, I think, unsound. This vaguely-conceived "law of the animal economy" is really no law at all. It is the *resistance* that the vital powers make to morbific agents, which pathologists have misnamed a law of the animal economy. Two diseased actions, or diseases in two different parts of the body, or obstructing or offending materials in two or more parts or organs, will manifest different phenomena from what are observed when one part or organ only is affected, because vital resistance is then distributed to several points instead of being concentrated at one.

If a person is laboring under a fever, that commotion of the organ

ism which we denominate the *febrile paroxysm* is the manifestation of the vital struggle to defend the organic domain against some morbific cause, or to expel some injurious matter. If the vital powers are making the principal effort to the surface, the introduction of a cathartic dose of epsom salts would divert some part of this vital effort to the bowels to meet, defend against, and expel the new enemy which is committing its ravages there, and thus purgation would result, while the depurating or remedial effect to the skin would be materially diminished. The seat of war would be changed, or the battle-field divided, but so far from being "a friend in need," the saline purgation, by drawing off and wasting a portion of vital power, would only prove a "foe indeed."

The water-treatment does not operate on the principle of antagonism or counter-irritation, according to the popular theory, for it does not produce a train of morbid actions constituting a new specific disease; nor does it put foreign, acrid, irritating, and deleterious ingredients into the blood, to produce some powerful impression at a dash, and then leave the vital powers to war against and waste themselves in counteracting or removing them for months and years afterward. It has been objected, that a cold bath was a morbid impression, as much as a hot blister, because it is an artificial instead of a natural method of applying water. But this argument is short-sighted. A cold hip-bath, for example, produces exactly the same vital phenomena, action and reaction, that our bodies are subjected to every day, and hour, and moment of our lives, differing only in degree. The first impression of the cold water causes the blood to recede from the capillaries; but the vital powers soon meet the impression by an increased determination of blood to the part, to balance the temperature of the body, and soon the capillaries become distended with blood, the part red, turgid, and in a warm glow. If this process is frequently repeated, the general result is to develop the superficial or capillary circulation of the part, and to that extent unload the vessels elsewhere, remove internal congestion, etc. If the impression is too strong for successful vital resistance, if the water is too cold for the ability of the patient to react, of course the opposite effect results; internal congestion is increased, and we have the *abuse* of the hygienic or remedial agent.

This determination to the surface in consequence of the impression of cold water, cannot be called a morbid action in any sense. If we go out of a comfortably warm room into a very cold atmosphere, our hands and face may at first become pale, cold, the vessels contracted and bloodless; but on returning to the room, and often under the continued application of the cold, reaction takes place, and they soon

appear more red and turgid, and feel warmer than before their exposure, for a few minutes, and then return to their usual appearance and feeling. So the slight disturbances of the circulation produced by ordinary bathing is merely an intensified contraction and relaxation, amounting to temporarily increased action, and followed by the same harmony of circulation as existed before. Atmospheric influences, vicissitudes of temperature, variations of exercise, etc. when not extreme or violent, produce temporary disturbances of the circulation, which, so far from being morbid, are really sanatory, nay, indispensable to full health and vigor. Nature allows us a liberal range of immunity in the employment and enjoyment of agencies naturally harmonious with our structures and functions.

But how different is the case if we take into the domain of life a substance chemically incompatible with its structures, or an agent physiologically incompatible with its functions. Although they are met with the same vital resistance as a cold bath, or a hot bath, their temporary impression is *never* succeeded by absolute equilibrium and quietude. They leave either a mark or a void in their track. When chemically incompatible, as are all the metallic and mineral preparations, they act upon, corrode, decompose, and destroy some part or portion of some constituent of some solid or fluid, of some organ or structure. Familiar and melancholy examples of chemical incompatibility are found in the ulcerations of the mucous membrane of the mouth, throat, stomach, and bowels, produced by the ordinary employment of saleratus in cooking, and the rotting of the teeth and bones in consequence of a mercurial course. When they are physiologically incompatible, like alcohol, tobacco, opium, etc., they exhaust, irrecoverably, some portion of the vitality itself. The impressions of drug-agents of all kinds are constantly destructive or exhausting so long as they are kept up; but the impressions from cold bathing may be continued during a whole lifetime without injury.

It is true that, in water-treatment, we apply cold water to the body when hot, hot water when cold, etc., not to antagonize action, but to balance action; the grand general indication in treating all diseases hydropathically being to *equalize* the temperature, circulation, and action. The principle of antagonism, as practiced allopathically, tends to silence the efforts of nature, to counteract the vital powers, to suppress the organic instincts, to obstruct the *vis medicatrix naturæ*, to embarrass the cure, and, in the majority of cases, to place the life of the patient in greater jeopardy than it would be with no medication whatever.

The true philosophy of water-cure, in almost every essential point

of doctrine, is diametrically antagonistical to the prevailing theories of the allopathic schools.

Some of the homeopathists have lately discovered that water acts on their favorite principle—*similia similibus curantur*. It is to my mind inconceivable how water can produce, in infinitesimal or any other quantities, any other *dynamic* effects than such as are referrible to temperature, bulk, or solvency. Water is the agent which homeopathy employs to dilute, and thus "enlarge the surface" and develop the pathogenetic property of its remedies; but how *it* is to be reduced to its third or thirtieth potency by dilution, is a problem which may be safely laid away among the unaccountables.

The eclectics, who "select the good and reject the bad" of all systems, claim that water acts like a hundred other drugs which are in "harmony with the constitution." They pretend to eschew all poisons, and use nothing but the "innocent remedies," which are best adapted to "aid and assist nature;" but, unfortunately for their fair pretension, we find a variety of vegetable and even mineral poisons among the everyday prescriptions of their writers and practitioners, as preparations of opium, and preparations of iron.

Rationale of Drug-Medication.—All the standard works on physiology and therapeutics of the drug schools throw not a solitary ray of light on the *modus operandi* of drug-medicines. The *effects* which a thousand different drugs produce upon the various functions of the human body, under almost all conceivable variations of conditions and circumstances, have been investigated with praiseworthy industry, and recorded with tedious minuteness and extraordinary precision. But *why*, *how*, and *wherefore* these effects are thus and so, we are as ignorant, as far as their labors are concerned, as are the inhabitants of the moon, who, it is presumable, do not have access to their books. *Why* tartar emetic or ipecac produces vomiting, *why* jalap or senna purges, *why* mercury or tobacco salivates, *why* opium or catnip produces perspiration, *why* nitre or green tea produces diuresis, *why* Spanish flies or boiling water raises a blister on the skin, *why* calomel or pink operates as a vermifuge, *why* aloes or iron operates as an emmenagogue, etc., etc., are problems as deeply in the dark now as they were before the light of medical science dawned upon the world, for all that appears in the writings of the standard authors, or the teachings of living professors.

But, fortunately for humanity, the principles upon which this explanation is founded are abroad in the world. Surely and steadily they are working their way into the understandings of reading and thinking

people, and just so soon as they are generally appreciated will the drug system of treating diseases be among the things that were. These principles are more fully developed in the writings of Sylvester Graham than in those of any other author. The works of George Combe contain some illustrations of them. The writings of Dr. Lambe, Dr. Alcott, Dr. Jennings, and Rausse, abound in teachings predicated on their recognition, while the practice of Priessnitz and his followers is constantly demonstrating the correctness of the explanation which they afford. I will try to present this matter clearly, for I am most undoubtingly convinced that the individual who fully understands it will be exceedingly loth to swallow any apothecary drug, whether it go by the name of drug-poison or drug-medicine; and he who has both philanthropy and intelligence will be as unwilling to administer those foreign agents to other stomachs, as to take them into his own.

There is a class of medicines known as *tonics*, or strengthening medicines. Books on materia medica define them to be such articles as give tone, or tonic contractility to the moving fibres, and at the same time augment the activity of the digestive function. Now among the tonics we find a most incongruous set of materials, as quinine, arsenic, boneset, iron, wormwood, oak bark, quassia, aloes, rhubarb, copper, zinc, etc. All authors agree that if the use of a tonic is long continued, the effect is *debility*. Here is a paradox. A tonic medicine first *strengthens*, and then *debilitates*. *How* are these results to be accounted for?

When a drug-medicine of any kind, or a poison of any kind, is taken into the stomach, the organic instincts recognize the presence of a something which is neither food nor drink; something unnatural; something which has no constitutional relation to any want or duty of any part or organ, hence an intruder, an enemy. The vital powers *feel* an attack upon the citadel of life, and prepare to act defensively. The lining membrane of the stomach is aroused to increased action; an unusual quantity of mucus and serum is secreted to protect the coats of the stomach from the poisonous or medicinal agent; but the stomach does not *suffer* alone; the alarm is communicated to other organs, to all parts of the system; and this manifestation of increased vital action, this disturbance of the organism, this commotion of the body, is regarded by the doctors as a tonic effect! How words deceive!

If but a few of these "tonic" impressions are made on the stomach, if only a few doses are taken, the vital powers, after enduring the siege, and defending themselves as well as may be, subside into their accustomed quiet, and the exhaustion, being not very great, is

specially noticed. But if these tonic impressions are kept up a long time, if the medicines be long continued, the vital expenditure is so great that the doctors call the evidence of its loss *debility;* and well they may. The organic instincts are finally wearied out, they become torpid, and refuse longer to respond to the impression; the lash ceases to be troublesome. Now it is that the doctor, who wishes to still keep up a tonic impression, who desires to *strengthen the system* yet a little more, brings a new recruit into the field. He administers another tonic; no matter what, if it be a *different* one. It works like a charm! The vital powers, though jaded and half palsied, are not yet dead. A new enemy will startle them again; an unaccustomed impression will again arouse them to resistance. If the first tonic was wormwood, the second may be arsenic, or *vice versa.* After the second tonic has spent its force, or, rather, after the vital powers cease to resist, a third one may be brought to bear; and so on, as long as the patience of the patient or perseverance of the practitioner can endure. Thus do tonics continually strengthen the patient, and leave him weaker in the end.

A decisive evidence of the correctness of this explanation is found in the fact, that every drug under heaven can be made to operate as a tonic. Mercury, lead, antimony, cod-liver oil, ipecac, gamboge, aqua fortis, or powdered glass—as incongruous a medley as can be conceived—will produce tonic effects, provided the dose is such as not to occasion any decisive evacuant or corrosive operation, by which the article is suddenly evacuated, or the structure altered. Cod-liver oil and ipecac have both had their day of reputation for improving digestion, or fattening the body. Why? Because when taken into the stomach, that organ being the point of attack, the vital powers are disproportionately directed to that organ in defense; and if the doses are frequently repeated, a determination of nervous or vital energy is established toward the digestive function. The digestive organs may thus be temporarily invigorated at the expense of all the rest of the body—a dear-bought method of promoting digestion and fattening the body, in the end.

But why do some poisons or medicines produce vomiting, others sweating, others purging, etc. Simply because they are, by means of those violent or increased efforts of the excernent functions, got rid of. It is a law of the animal economy, that all injurious agents which gain admission, no matter how, within the domain of vitality, are counteracted, neutralized, or expelled in such manner as will produce the least injury or disturbance to the organism. If a very large dose of ipecac, for example, is swallowed, so large as to prove immediately dangerous to life, or seriously destructive to the structural or functional integrity of the stomach, its action is met with such violence of resist

ance as to produce severe spasmodic contractions of the muscular fibres of the stomach and the abdominal muscles, by which the ordinary peristaltic motion of the alimentary canal is reversed, and vomiting results. If the dose be smaller, a profuse watery secretion is poured out upon it from the mucous and lining membrane of the stomach and bowels, to dilute it, and render its presence less harmful, while it is conducted along the alimentary canal by the ordinary peristaltic motion, and expelled from the bowels, and thus we have a cathartic effect. If the dose be still smaller, it is largely diluted with serum, taken up by the absorbents, carried into the mass of blood, and finally thrown off by the skin, this being the manner in which a small quantity can be most easily got rid of, and thus we have a diaphoretic operation. If the dose be even yet smaller, so that no special effort of the organism is made to throw it off at either emunctory, the vital powers meet, decompose, and destroy it in the stomach, for which purpose there is an increased determination of blood and of nervous influence directed to the part, and hence we have its tonic effect. Thus may a single article of the materia medica produce, according to the quantity administered, the various and seemingly opposite operative effects of *vomiting*, *purging*, *sweating*, and *strengthening;* while each effect is attended with an absolute waste of vital power.

It is well known, too, that all drugs lose a degree of their potency by repetition; in other words, the vital resistance is gradually overcome or worn out, so that, to produce the same operative effect, the dose must be constantly augmented. Those who find a sufficient stimulus in one glass of brandy per day, frequently find ten required in a few years to produce an equal excitement; those who commence on one cigar daily, generally end with several; and those who find at first one patent pill sufficient to move the bowels, not unfrequently find twenty or thirty an inefficient dose after the vital resistance has been pretty thoroughly subdued.

When medical books, therefore, tell us that drugs lose their *remedial* effects by long continuance, we are to understand that *vital resistance* is subdued; for so long as the organic instincts act *against* the remedy, so long will the phenomena of resistance occur, which medical reasoners, starting from mistaken premises, call medicinal. It may be remedial, and is, in a certain sense—rendering evil for evil.

If a blistering compound, which acts chemically or corrosively upon the structures, is placed upon the skin, serum is poured out, the cuticle is raised, a collection of water is formed as a barrier to the farther approach of the adversary, the scarf-skin is sacrificed to save the true skin, and the red, turgid, inflamed blood-vessels show the violence of

this defensive struggle. It may be that the vital energies which were struggling against the cause of a deeper-seated pain are so diverted to the new point of attack—the blistered surface—that the prior pain is no longer felt. The doctor calls it cured; it may be cured, and yet its cause be aggravated, and the patient only the worse for the cure.

The grand distinctive effects of homeopathic and allopathic practice are not to be explained on the principle of "*similia similibus curantur*," nor upon the principle of "*contraria contrarius curantur*," nor upon both principles together, but upon this principle of vital resistance we are considering. Let me illustrate this point.

Tea, coffee, catnip, thoroughwort, uva ursi, milkweed, etc., are medicinally diaphoretic and diuretic; in other words, the vital powers expel them through the skin and kidneys, the expulsive effort being denoted by diaphoresis and diuresis. From improper food, vitiated air, impure water, or suppressed perspiration, the blood may be loaded with morbific matters, which the vital powers are naturally disposed to expel through these depurating organs—the skin and kidneys. Now while the vital powers are making a special effort to get rid of the special cause of disease—morbid matter—let us see what happens by the special introduction of a medicinal drug. Precisely this. If the drug be so small in dose as not to disturb seriously the first passages, and provoke vital resistance there—that is, if it be homeopathic—it passes on into the circulation, to be expelled through the skin and kidneys; thus, by adding another morbid cause to the existing one, both of which incite the vital powers to expulsive efforts through the same channels, the determination to the skin and kidneys is increased; the *remedy* does actually increase the *remedial efforts* of nature, for the simple reason that it provides a greater duty for nature to perform. When the morbid matter of the disease and the morbid matter of the drug are got rid of, we have a cure on the homeopathic principle.

But suppose the dose to be allopathic, that is, large enough to produce a strong impression on the stomach and bowels, and excite active resistance in the first passages. Here are then two sets of vital efforts at work in different directions, at variance with and counteracting each other; one to the skin, to expel the morbific causes of the disease, and the other to the primary nutritive functions, to resist the morbid matter of the medicine. The efforts of nature being thus divided and distracted, are rendered inefficient for either duty; but if the impression of the drug be *very* powerful, it may produce a new disease, and draw off all the remedial efforts from the skin and kidneys to resist its action, and then we have a cure on the allopathic principle. The disturbance of the skin and kidneys is silenced, and all that is required is

to recover, if possible, from the factitious malady—the effect of the drug.

We can more readily understand how vastly superior the homeopathic practice is, in all those cases of disease, as the simple fevers and exanthems, wherein the efforts of nature are directed especially to the skin, and wherein they are, in almost all cases, when left to themselves, equal to the task of overcoming the difficulty. The infinitesimal dose does not, to any appreciable extent, hinder the success of those remedial powers inherent in the living organism. We can account for another problem, too: the superiority of the allopathic practice in a different class of diseases, in obstructions of and morbid accumulations in the alimentary canal, where the strongest impression of the allopathic dose can be made in the line of direction of the remedial efforts of nature. In the case of a simple fever the allopathic dose would interrupt the natural course of these remedial efforts; but in a case of constipation from retained excrementitious matters, the homeopathic dose would work adversely.

I am far from denying that, under certain circumstances, drug-medication, either homeopathically or allopathically, may do much more good than evil, though I contend that such is not the general rule; but I insist that the true healing art contemplates a method of medicating diseases on an entirely different basis; and a true basis, I claim is furnished by the philosophy of the Water-Cure system, which abjures drugs, and depends wholly on hygienic influences.

There is nothing in medical experience more speciously delusive than the stimulating practice in cases of extreme prostration and debility. When a fever, for example, "turns," or completely subsides, the patient is weak and relaxed; and if he has been *severely* drugged, he will be *very* weak. The doctors of all schools, except the hydropathic, are always afraid the patient will "sink," or "run down," unless kept up with brandy, wine, quinine, or some other diffusible stimulant or tonic. Hence, no sooner is a fever subdued by reducing agents, than it is produced again by exciting agents, on the absurd theory of sustaining the body on mere stimulation until it can recover its balance, or in some mysterious way acquire a faculty of existing without it. This "fallacy of the faculty" has been the death of no small number of the earth's inhabitants.

It is no uncommon circumstance for a patient to be dosed with a quart of brandy, or a gallon of wine, in twenty-four hours, every swallow occasioning a new organic resistance, and a further waste of vital power, and imperiling the patient's life, while the doctor is firmly impressed with the belief that the patient's breath remains in his body

only by virtue of the alcoholic stimulant. It is easy to account for this delusion. When the fever is up, the physician is afraid of death from its violence; but he knows the patient will not die, in ordinary cases, until the cold stage of the paroxysm becomes permanent. When the fever is down—that is, in the cold stage—the patient is pale, cool or cold, the features sunken, and the pulse low, natural consequences of the previous febrile excitement. The organism now requires rest, quiet, perhaps nourishment. But the doctor, fearing this depression will end in death, kindles up the fever again. So long as the system will respond to stimuli, so long as the vital powers will manifestly resist the morbid impression of the stimulant, the body is not absolutely death-struck, and the doctor has the satisfaction of knowing that the patient is not *now* dying. But this evidence of his existing vitality is the expenditure of a part of that vitality, hence, although the stimulant causes him to manifest more signs of life, it also hastens or endangers his death, for the simple reason that it causes a further waste of vitality.

But it may be objected that our theory of vital resistance, though applicable to those agents which produce *evacuation*, or increased action of the circulating system, will not explain the phenomena produced by the *narcotics*, which operate in a very different manner. Let us see. Medical books tell us that opium in small doses *suppresses* all secretions except the cutaneous, which it *promotes*. What is this but the effort of the vital powers, all concentrated, as it were, to expel it through the skin? In large doses opium always creates nausea, and usually vomiting, evincive of the effort of the vital powers to expel it at once from the stomach. The pure narcotics, as henbane, belladonna, stramonium, cicuta, prussic acid, etc., are really evacuants in relation to the nervous power. Being so deadly in their influence, they are met with an energy proportioned to their potency of dose, and the *shock*, as it were, is often sufficient to destroy the organism in a moment, like that from a Leyden jar, or a surcharged electric cloud. In very small doses the pure narcotics are thrown off more or less by all the excretory organs, but more especially the skin.

In conclusion, we may find a convincing illustration in the effects of the very Sampson of the allopathic materia medica—mercury. No medical books pretend to explain the *modus operandi* of this drug, but all agree that it *promotes all the secretions of the body*. It is this general effect upon all the secretions which causes mercury to be regarded as a universal alterative, and administered, too, so freely and so fatally in almost all the diseases incident to humanity. But *how* and *why* does mercury promote the activity of all the secreting organs? Because

its operation is, although very slow and gradual, is chemically destructive to some of the constituents of all the fluids and solids of the body; hence it is every where met with active vital resistance, either to expel it at the natural outlets, or involve it in mucous, so as to neutralize or lessen its ruinous consequences while it remains in the system. Its universally remedial operation is only the evidence of universal war in the organism, the final result of which must inevitably be universal ruin, to a greater or less extent, of the vital powers.

CHAPTER II.

WATER-CURE PROCESSES.

THE hydropathic appliances embrace all the usual methods of vapor, warm, tepid, cool, and cold bathing, besides a variety of processes which have had their origin in the development of Water-Cure as a system.

Fig. 164.

THE WET-SHEET PACKING.

THE WET-SHEET PACKING.—This process, the *lien tuch* of the Germans (fig. 164), is admirably calculated to answer two general indications, which are manifestly leading ones in a long catalogue of maladies, both acute and chronic, viz., to reduce the heat of the body and the force of the circulation, and, as an alterative, to correct morbid and restore healthy secretions. It produces also, incidentally, a powerfully detergent or cleansing effect, and generally exerts a wonderfully sedative or soothing influence on the whole nervous system. The first disagreeable sensation of cold is usually soon followed by a pleasurable warmth over the whole surface. It is capable of superseding, to advantage, bleeding, antimony, salts, hydriodate of potassa (iodide of potassium), calomel, and opium, and a hundred other more or less injurious agents.

In fevers, and in all acute inflammatory disorders, it may be employed with a freedom exactly proportioned to the degree of morbid heat and force of the pulse; that is, continued, with frequent changes, until the temperature and circulation are reduced to the natural standard, and the skin becomes soft and perspirable. Much sweating is not usually to be desired.

In nearly the whole range of chronic complaints, there is one prevalent morbid condition, ever varying in intensity, yet consisting essentially in a deficiency of blood in the superficial and capillary vessels, and an accumulation or engorgement in the large internal vessels, with consequent congestion in some one or more of the viscera. To reverse this condition, relieve the overburdened internal organs, and supply the deficient external circulation, the wet-sheet process, aided by the proper auxiliaries, is the best known remedial agent.

Dr. Gully well remarks: "This process repeated day after day, and sometimes twice daily, at length *fixes* a quantity of blood in the blood-vessels of the entire skin, and thereby reduces the disproportionate quantity which was congested in the inner skin, or mucous membranes."

If any one doubts the purifying efficacy of this process, he can have a "demonstration strong" by the following experiment: Take any man in apparently fair health, who is not accustomed to daily bathing, who lives at a "first-class hotel," where they fatten their own chickens and pigs on the refuse matter of the kitchen, takes a bottle of wine at dinner, a glass of brandy and water occasionally, and smokes from three to six cigars per day. Put him in the "pack" and let him "soak" one hour or two; on taking him out, the intolerable stench will convince all persons who may be present that his blood and secretions were exceedingly befouled, and that a process of depuration is going on rapidly.

The time for remaining "packed" varies greatly in different cases. The average time is from thirty to sixty minutes, though in some few cases fifteen minutes is long enough, while others may remain enveloped two hours to advantage. Persons of highly nervous temperament, and rapid though feeble pulse, and those laboring under great debility with considerable irritability, should remain in the wet sheet only until the body becomes comfortably warm. Those having a more torpid circulation and phlegmatic temperament, unattended with much debility, may remain a much longer time.

Much of the comfort or disagreeableness of the process depends on the skill and dexterity of the attendant. There is at least as much science in applying wet cloths to the naked body as in rubbing in an

ointment or putting on a blister. A person may be wrapped up so slowly, loosely, and unevenly by an awkward hand, as to find the whole affair from beginning to end exceedingly uncomfortable; or the clothing may be so rapidly and nicely adjusted, as to give the patient an hour or so of actual enjoyment.

Light cotton, hair, or sea-grass mattresses, or even straw, for those accustomed to very hard beds, may be used for "packing." On one of these spread from three to five large thick comfortables, then a pair of soft flannel blankets, and, lastly, the wet sheet lightly wrung out, so as not to drip. Two pillows placed on the mattress are necessary for the head. The patient, lying down flat on the back, is quickly enveloped in the sheet, followed by the blankets and comfortables. A light feather bed may be thrown over the top, in which case two comfortables less will be required. If the feet remain cold, bottles of hot water should be placed to them. Headache is prevented or removed by the application of cold wet cloths. In wrapping up the patient, great care should be taken to turn the clothing snugly and smoothly around the feet and neck. For very delicate persons, the sheet should at first be wrung out of tepid, or even warm water. On coming out of the "pack," the plunge, douche, rubbing wet-sheet, or towel washing may be employed, as either is speedily indicated.

Some hydropathists recommend the sheet to be wrung as dry as possible, and others advise it to be used quite wet. I prefer a very wet sheet in all cases wherein the patient is not deficient in external heat. When the skin is very cold and torpid I would advise it to be as dry as the attendant can conveniently wring it.

Some persons, whose pores are pretty effectually closed up with bilious accumulations, find it rather difficult to get entirely warm at first. In a few days, however, the glow comes up readily, and it ceases to be dreaded. Such cases are benefited by a good deal of friction to the skin over the wet, and then the dry sheet.

There are some few patients, of weak vital energies and extreme susceptibility, who very soon get warm in the wet sheet, and immediately after grow chilly again; and in some cases, if they remain yet half an hour longer, a comfortable reaction will come on again. Such persons should be taken out, if possible, during the glow upon the surface. If it so happens that they get an unpleasant chill after coming out, a thorough rubbing, followed by fifteen or twenty minutes dry packing, will usually obviate all injurious consequences.

Headache, languor, muscular debility, and giddiness, if serious and long continued, generally indicate that the envelop has been continued too long. When they occur repeatedly the time should be shortened.

A *linen* is always to be preferred for "packing," more especially in warm weather.

The wet sheet is not a sweating process, as generally supposed, although frequently a moderate, and occasionally a copious perspiration takes place. It is permanently either a cooling or a heating process, according to the degree of envelopment. When the object is to reduce fever or inflammation, the patient should be lightly covered, and the wet sheet frequently renewed. In chronic diseases, when the intention is to produce reaction and develop the external circulation, an additional quantity of bedding secures this object. As a cooling process, it may always with safety be frequently repeated, until the force of the pulse and the preternatural heat are reduced to the normal standard. Under its judicious employment in chronic diseases, the skin gradually becomes softer, velvety, and more porous and delicate; its structure more firm, and its functions more vigorous.

The Half-Pack Sheet.—This is the application of the wet sheet as above to the trunk of the body only. It is milder, yet less efficacious, than the full pack. It is only employed on feeble persons, who have not sufficient vitality for the whole sheet, or as a preparatory measure for the entire envelopment.

The Douche.—The primary object of the douche (*doosh*) bath, fig. 165, is to arouse the activity of the absorbent system, and this it certainly accomplishes in a most powerful and effectual manner. It is well adapted to chronic enlargements of the viscera, tumors, swellings and stiffness of the joints, local attacks of gout and rheumatism, obstinate constipation, the incipient stage of tubercular consumption, and many other disorders. The force of the stream and time of application should be carefully adapted to the strength of the patient. Very nervous persons, and those subject to a determination to the brain, must resort to it with extreme caution. Generally the stream should be directed to the back of the neck, along the spine, hips, and shoulders; in chronic swellings of the joints the stream may be directed to the affected

Fig. 165

THE DOUCHE

parts; in cases of torpid bowels a moderate stream may be applied to the external abdominal muscles. No strong douche should ever be taken on the head, nor should it be long continued on any one spot about the spine or back bone.

Douches may be so constructed as to produce any degree of impression, from that which is scarcely appreciable, to one as powerful as the muscular system can endure, according to the size of the stream, its fall, pressure, etc. They may be *vertical*, *oblique*, *horizontal*, or *ascending*. Those most generally in use are perpendicular streams from one to two inches in diameter Smaller streams, as inch and half inch are better in some cases The oblique and horizontal streams can be more conveniently applied locally when indicated, and in many cases, as in difficult respiration, it is advantageous to have the bodily position erect during its application. The ascending douche is particularly valuable in piles, prolapsus of the uterus or bowels, constipation from debility, etc. The stream should not be forcible enough to cause absolute pain nor serious inconvenience; the stream may be half an inch to an inch.

Warm water douches have been employed but little comparatively, but I think they are destined to grow in favor. In many cases of rigidity of the muscles, painful swellings, chronic inflammations of the joints, in neuralgic affections attended with extreme nervous irritability, and in spasmodic and bilious colic I have known excellent effects from streams of warm water applied to the parts affected. They are also useful in obstinate constipation, retention of urine, amenorrhea, etc. As the object of a warm douche is to *relax* instead of contracting the muscles of the affected part, a small stream long continued is the best; it should be followed by the cold dash for a moment.

The *hose-bath* is a modification of the douche; it may be employed horizontally or obliquely to any part of the body, the force being regulated by a stop-cock.

The Rubbing Wet-Sheet.—This bath produces a strong and general determination to the whole surface. The shock is generally rapidly succeeded by vigorous reaction, which is further promoted and maintained by active friction. It is applicable in all cases wherein a strong diversion from the internal viscera, or the mucous membrane of the alimentary canal, to the skin, is required. It is more or less serviceable in nearly every condition of disease wherein the patient has sufficient reactive energy to prevent a permanent chill. In the primary stage of fevers, in the early stages of bowel complaints, colic, diarrhea, dysentery, cholera, etc, it is particularly valuable. In these

cases it should be applied frequently for a few minutes, and the skin rubbed energetically and perseveringly. In the great majority of skin diseases it is among the best resources of hydrotherapia. It is one of the best kind of "wash-downs" to follow the pack.

The rubbing wet-sheet is an admirable bath for the sedentary and studious; for exhaustion consequent on severe mental exertion; for mental disorders, and many states of insanity; for nearly all spasmodic and epileptic conditions; for delirium tremens; for night sweats watchfulness, nightmare, etc.

When employed drippingly wet (*the dripping sheet*), a large tub or dripping pan is necessary for the patient to stand in. When wrung so as not to drip it may be used in any room or on a carpeted floor. The sheet is thrown suddenly around the patient's body, which it closely envelops from the neck to the feet, and the body is rubbed by the hands of the attendant outside the sheet; in ordinary cases five minutes are sufficient. Some prefer a larger sheet thrown over the head and reaching down to the feet, by which the patient can himself exercise by rubbing in front while the attendant rubs the back part of the body. I do not see any special advantage in this to offset its awkwardness. The patient can and should make active friction over the chest, abdomen, and lower extremities, if the sheet is thrown around the neck, leaving the head out. It is succeeded by the dry rubbing sheet, or rubbing with dry towels.

THE HIP OR SITZ-BATH.—The sitting-bath answers the several indications of tonic, derivative, and sedative. It is invaluable in weakness, irregularity, obstruction, and torpor of the lower organs of the pelvis and abdomen. Any common wash-tub will answer for its administration, though it is more convenient to have vessels made for the purpose, the bottom raised a few inches from the floor, the back side raised to rest against. The water, as a general rule, should cover the hips and lower portion of the abdomen. It may be of any temperature, from very warm to extreme cold, according to the case; and the time of application varies from five to thirty minutes. The cool and cold sitting

Fig. 166.

THE SITTING-BATH.

baths are far the most frequently indicated, and the usual time is from ten to fifteen minutes.

In the cold stage of fever, the warm sitz-bath very much mitigates the severity of the chills, and, if followed by the cold-rubbing wet sheet when the hot stage of the paroxysm supervenes, will often break up the attack in a few hours. In acute inflammations of the liver, stomach, bowels, spleen, and kidneys, hip-baths should be used very frequently, conjoined with the plentiful use of tepid or cool water in injections. Debility of the external muscles of the abdomen, caused by the excessive use of tea and coffee, or crooked positions of the body, evinced by short breath, weakness in the small of the back, and trembling of the knees, is greatly benefited by this process, used as cold as can well be borne. A blanket is usually thrown around the patient during this bath.

The best *tonic* effect of hip-baths is secured by having them of short duration—five to fifteen minutes—and frequently repeated.

A *derivative* effect is obtained by longer baths—fifteen to thirty minutes—and at greater intervals. It must be noticed, however, that the effect of any bath is determined as much by the condition of the patient as the length of the bath. Tonic hip-baths are more or less derivative; but to get the greatest derivative effect, the bath should be continued as long as reaction is vigorous, but not carried to the extent of producing the second chill; if so, determination may take place to the internal organs instead of derivation from them. Derivative hip-baths should not be carried to the point of producing paleness or lividness of the lips, general shivering of the whole body, nor nausea at the stomach, for they would thus endanger congestion of the brain or lungs. In treating affections of the head and chest, for which this bath is one of our best resources, great caution should be exercised in managing them so as to secure a derivative without producing a revulsive effect.

Some of the effects of sitting-baths, usually called derivative, are really *sedative;* no matter, though, so long as they work curatively. In a general fever, for example, when the whole body is preternaturally hot and turgid, a long-continued bath of this kind operates as a refreshing and fever-assuaging sedative.

The temperature of the water, and its quantity, also have some influence in determining whether its effects shall be tonic, derivative, sedative, or repellant. The rule of practice, is to lessen the quantity of water, or raise its temperature, according to the coldness torpor and debility of the patient.

THE SHALLOW-BATH.—This, as usually employed, is a powerfully alterative, mildly derivative, and moderately sedative bath. It is sometimes used cool, seldom very cold, but generally tepid, from 65° to 75°. The common shallow-bath tub may be used, but a circular or oval tub, raised about twelve inches from the floor, is more convenient for the attendant. In private families any tub large enough for the patient to sit upright will answer. The water should be from four to six inches deep. During the bath the abdomen and lower part of the body should be well rubbed by the patient if able; if not, by an attendant; while the head is sprinkled and the back and chest rubbed by the attendant, who sprinkles those parts, or dips his hands occasionally in water. When there is no chilliness, a pail of cold water (*the pail douche*) should be poured on the chest and shoulders to complete the process. This bath may be employed from one to fifteen minutes with those who are very feeble and sensitive to cold, and from fifteen to thirty minutes with others. It is usually followed by the dry rub sheet; sometimes also by the hand rubbing. When used for a long time, the water is renewed as often as it becomes quite warm.

Fig. 167.

THE SHALLOW-BATH.

Many nervous and delicate invalids will find this the best bath to follow the wet-sheet pack. It is also one of the best leading baths in the treatment of cutaneous affections, in mineral diseases, in mercurial affections of the joints, in sick headache and "rush of blood to the head," in apoplectic, epileptic, paralytic, and hysterical affections, in "sun-stroke," intoxication, delirium tremens, etc.

In some instances the half-bath has been continued for several hours with decided benefit. When there is uniform and preternatural heat of the surface, in any of the above-named diseases, it may be protracted as long as those symptoms can hold out, with perfect safety; but in all other cases short baths often repeated are preferable to very long ones; the former are never dangerous, the latter *possibly* may be

THE HALF-BATH.—The half and shallow-baths are often spoken of as the same Some authors make a distinction by calling the ordinary shallow-bath a half bath, when the water is about one foot in

depth, so as to cover the lower part of the abdomen, as well as the lower extremities. This is in effect intermediate between the shallow-bath and full-bath, or plunge, and is employed when the reactive power of the patient admits of a stronger impression than the former, yet is not sufficient for the shock of the latter. It is specially adapted to those cases for which the shallow-bath is indicated, when they are complicated with great weakness of the external abdominal muscles, deficient action of the kidneys, obstructions of the liver, leucorrhea, menorrhagia, etc. In relation to time and temperature, it is to be regulated by the same rules as the shallow-bath.

Dr. Johnson *(Domestic Hydropathy)* says, in allusion to this bath: "Place me under the most unfavorable circumstances, viz., in the heart of a large town, let me have my fair average of all sorts of cases, new and old, acute and chronic, slight and severe, and give me the shallow-bath, the sitz, and the wet-sheet, and no other bath whatever, and let me have an opportunity of frequently seeing my patients—I would undertake to cure or relieve more cases than are now cured or relieved by the ordinary drug-treatment in the proportion of two to one." I think the doctor is safe enough. It would not become me to speak for London practice, but as for drug practice in New York, I would confidently undertake the same task with either one of these three baths, or with a pail of pure soft water and a crash towel, without either of them.

Fig. 168.

GOING FROM PACK TO PLUNGE.

THE PLUNGE-BATH.—Immersing the whole body up to the neck quickly, when the patient has room and opportunity to exercise his limbs under water, is all that is essential to the full benefit of this process. It is generally preferred after the sweating process, and very frequently after the wet sheet, by those who are able to bear the exertion. The patient wears the wrapping-sheet and blanket (fig. 168) to the bath, having his feet sufficiently released to walk, and as a useful precaution, wets the head and chest, and then plunges into the water, either head-foremost or feet-foremost, as he fancies. The shock produced is much less than most persons would suspect, while the reaction

is generally rapid, equal, and extremely agreeable. It may be advantageously employed more or less in the majority of all chronic diseases which are not attended with strong determination to the brain, great disturbance of the circulation, or difficulty of respiration. It is one of the most pleasant and refreshing morning baths taken on first rising from bed; and by all, except the very feeble, it may be employed colder than any other bath can be, with equal comfort.

Invalids with lungs so tuberculated as to prevent a full inflation, do not bear the plunge well, nor persons laboring under organic affections of the heart, nor those laboring under dropsical accumulations of the chest or abdomen; in these cases it disturbs the circulation and respiration too much. But with all invalids or other persons who have moderate vigor and a pretty well-balanced circulation, with no serious local determinations or organic lesions, there can be no more agreeable or exhilarating bath.

A plunge-bath may be easily constructed wherever there is a running stream. A square plank box, four or five feet in depth, makes a good and cheap one; its dimensions may be large enough for a swimming-bath to advantage, if there is room.

The temperature of the plunge is usually from 55° to 65°, and the time for remaining in the bath varies from a very few seconds to two or three minutes, in chronic diseases; in high fever or general inflammation of the whole system, the patient may remain ten or fifteen minutes—at all events, until thoroughly cooled.

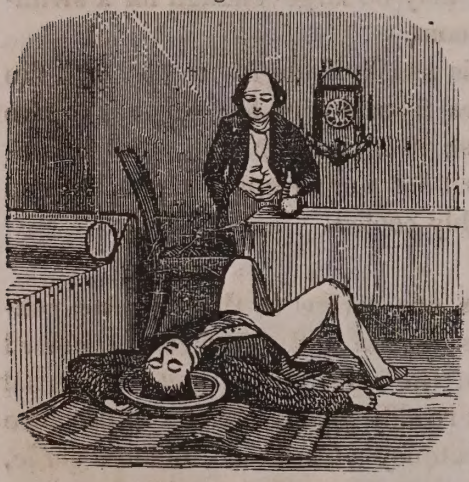
The Foot-Bath.—Most persons are aware of the intimate connection between the whole nervous system and the feet, manifested by the extraordinary susceptibility of the soles of the feet to external impressions; and such persons must readily appreciate the importance of this remedial appliance. The potency of mustard, onions, garlic, vinegar, ginger, pepper, and other pungents, applied to the feet, in a variety of aches, pains, cramps, and spasms, has long been celebrated among physicians and nurses. The intelligent hydropath will admit the importance of the principle—sympathy—upon which the employment of those articles has been based, while he will produce every desirable result of them all with simple water. As a derivative in affections of the head and chest, it is often used in connection with the sitz-bath, with which it may be advantageously alternated. To prevent or remedy habitual cold feet, it is absolutely indispensable in a hydropathic course. Active exercise, in this case, should generally precede and follow the cold foot-bath. The rules given for the regulation of the sitz-bath will apply to this Any vessel large enough to admit the feet

and water enough to cover them ankle deep, will answer. The time is usually from ten to fifteen minutes.

Persons of very feeble circulation, and who are unable to take much exercise, should use shallow foot-baths for about five minutes, the water being not more than one or two inches deep. The feet or toes, or both, should be kept in motion during the bath. Walking foot-baths, where a stream of cool water can be found with a clean bottom, is a most efficient remedy for habitual cold feet, and one of the best appliances for chronic headache, restlessness, sleeplessness, and also one of the most excellent and efficient strengthening processes for almost all forms of female weaknesses and obstructions.

The warm foot-bath is often valuable to relieve sudden attacks of headache, and soothe the nervous system when unusually irritated. Many delicate invalids who are habitually liable to cold feet, will find the wet-sheet pack more pleasant and agreeable by putting the feet in warm water for three minutes before being enveloped.

Fig. 169.



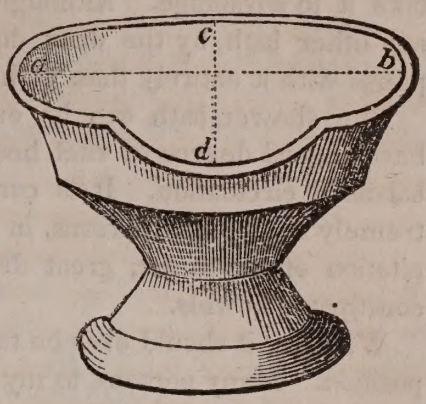
THE HEAD-BATH.

THE HEAD-BATH.—The common method of bathing the head is by folds of wet cloths, or a stream of water poured over the head. In all acute diseases about the head, attended with pain and increased temperature, those processes are sufficient, but in some chronic affections a powerful derivative or sedative effect is desired. For this purpose the patient lies extended on a rug or mattrass (fig. 169), the head resting in a shallow basin or bowl, holding two or three inches of water, the shoulders being supported by a pillow. It may be administered from fifteen to thirty minutes.

When the pouring head-bath is employed the patient lies face downward; the head is held by the attendant and projecting over the side of the bed; the bedding being protected by a sheet or blanket thrown around the patient's neck; a tub is placed under the head to catch the water. The water is poured from a pitcher or other convenient vessel moderately but steadily for several minutes, or until the head is well cooled, the stream being applied principally to the temples and back part of the head. This process is excellent in all high fevers and in the early stages of colic and cholera morbus.

Fig. 170 represents a convenient vessel for a head-bath. Length from *a* to *b*, 11 inches; breadth from *c* to *d*, 8 inches; depth, 3½ inches; height from the floor, 7 inches. The bottom is concave.

Fig. 170.



VESSEL FOR THE HEAD-BATH.

The cold cloths, or pouring stream is beneficially employed in convulsions, delirium tremens, rheumatic affections of the head, transferred gout, epilepsy, apoplexy, nose bleed, inflammation of the brain, etc.

In chronic diseases of the eyes and ears, earache, partial or complete loss of hearing from debility of the auditory nerves, dimness of vision from local debility, morbid depositions in the humors or structures of the eye, chronic catarrh, etc., the bathing vessel is advantageous.

THE SHOWER-BATH.—This bath is greatly misused by many persons, and is generally sadly mismanaged by allopathic physicians. Cases like the following are everyday affairs in New York: A patient has been under drug-treatment a long time without benefit; he has been entirely unaccustomed to regular bathing in any manner, and has never taken a cold bath, nor has the doctor even hinted at any sort of a bath during his whole course of medication. But, getting discouraged, the patient begins to annoy his medical adviser with questions about the Water-Cure; the latter speaks in the highest terms of the remedial uses of water *in the hands of competent persons;* thinks it is a very good remedy indeed in many cases, *but in this particular case it probably would not answer; it might produce congestion!* Still the patient may, if disposed, try it and see—that is, on his own responsibility. He may try a shower-bath, and ascertain thereby how the treatment will be likely to operate. Influenced by these loose inuendoes, and without any precautions or regulations, the patient takes two, three, or half a dozen shower-baths. Each one gives him a disagreeable chill, perchance a violent headache, and makes him fee decidedly worse in every sense. He goes back to the doctor, who shakes his head portentiously, looks "wondrous wise out of all his eyes," and exclaims, "I was *afraid* it wouldn't work well; cold water is a very powerful agent; very dangerous when not properly managed."

Now the shower-bath is excellent in its place, but in almost all cases it is the very worst bath to commence on an invalid with. Generally patients require considerable preparatory treatment before they can

take it to advantage. Although it is more frequently prescribed than any other bath by the drug doctor, the hydropath would sooner dispense with it entirely than with any other.

The shower-bath can be employed profitably only by those who have a good degree of vital heat, and a rather active and pretty well balanced circulation. It is contra-indicated in very nervous and extremely susceptible persons, in those liable to nervous headache, palpitation of the heart, great determination to the lungs, or severely constipated bowels.

Whether it should ever be taken on the head is a controverted proposition. Many persons, to my certain knowledge, have taken it freely on the head as well as all over the body, as a daily bath, for years, not only without any unpleasant symptom, but with uniform pleasure and advantage. But I have known many invalids with whom it would occasion more or less headache or giddiness, when applied to the head, and none whatever when only taken upon the rest of the body. The safest general rule is to direct patients to incline the head forward so as to let the shock fall upon the neck, spine, and shoulders. It may also be freely applied to the chest and abdomen.

Its principal advantage is in affording a convenient morning bath; a good wash down after the wet sheet, when no other bath is specially indicated, and also after the hot and vapor baths.

In the stupor of drunkenness a smart shower of cold water often restores sensibility very promptly. The cold shower has recently been introduced into the penal transactions of our criminal code. Refractory culprits are often brought to prompt obedience by its terrors. The prisoners are said to dread it worse than the old-fashioned, barbarous methods of flagellation. It is certainly more humane, but is liable to do injury to those who are extremely susceptible, with a tendency to head affections.

This bath has long enjoyed considerable repute as a popular remedy for rickets and other cachetic affections of children. It is managed so injudiciously in home practice as to work more mischief than benefit, as the following anecdote will illustrate I once saw what was intended for a shower-bath, administered in this fashion: a good mother became anxious about her little boy, who was about a year and a half old; he appeared to be "poorly," without having any particular disease for which a name could be found. The doctor gave it oil, rhubarb, "a touch of calomel," elixir drops, worm seed, and strengthening things in abundance, but it stayed "poorly." Some kind neighbor advised showering, and the mother concluded to try it. The next morning, which happened to be of a keen, blustering, November day, the

mother, at early sunrise, drew a pailful of water from the bottom of a deep well, stripped the child naked, placed it out-door on the bare cold ground, and then threw the pail-douche over it at a single dash! The result was a fever, which lasted the child a week. The child should have been placed in a tub in-door, and the water poured over it gently.

THE CATARACT-BATH.—This is a pleasant yet powerfully excitant bath Dr. Johnson, from whose work I take the illustrative cut, thus describes it:

Fig. 171.

THE CATARACT-BATH.

In Fig. 171 *a* and *b* are two tin cylinders, containing six or eight gallons each. These are fixed at the top of the frame-work of an ordinary shower-bath, the common cistern and perforated plate being removed. By pulling a string, these cylinders are tilted so as to discharge their water, as is seen in the plate. The inner side of each cylinder should have a lip, to give a more forward direction to the cataract of water.

The cataract-bath may be employed for the same general purposes as the douche. It is a good substitute for the wave-bath, and for the plunge in those who cannot bear the exertion required by the latter.

THE DRY PACK, OR SWEATING-BATH.—Wrapping in the dry blanket is managed precisely as the wet-sheet packing, with the omission of the wet sheet. The flannel blanket comes in contact with the body, and a sufficient quantity of blankets, comfortables, or other bedding is thrown around to retain the animal heat. Very nervous and irritable persons should not be wrapped very tightly about the chest. A wet napkin should always be applied to the head, and the room should be well ventilated. The sweating process usually occupies two or three hours. Some few persons will perspire freely in less than an hour, and some will remain four or five hours without sweating much.

When the patient perspires with difficulty, exercising by extending the limbs forcibly, accompanied with deep, full inspirations, will very much accelerate the process. One, two, or three tumblers of water are taken at intervals during the envelopment. Dr. Johnson recommends a little allopathic auxiliary in the shape of "a pint of hot, weak,

black tea!" I would recommend the patient to abstain, teetotally, from all such nonsense.

The patient should never remain long enveloped after sweating has become copious; it is much better to perspire moderately and frequently. On coming out of the sweating-blanket, some form of cool or cold bath should be taken, as the plunge, douche, shower, shallow-bath, or dripping-sheet. The sweating process is one of the severest of the Water-Cure appliances, and must always be managed with care and discrimination. If the patient becomes very restless, or if troublesome headache, giddiness, or palpitation come on, he should be taken out. Patients will usually bear this application better after a few repetitions.

Many people suppose, and some medical writers represent—among whom is Dr. John Bell, in his able work on Medical and Dietetical Hydrology—that the sweating process is a regular part of the hydropathic routine. This is a great mistake; sweating is not the rule, but the exception in water-treatment. It is very seldom resorted to in any respectable establishment, and Priessnitz recommends it now much less frequently than formerly. It is the nearest approach to allopathic treatment of any of our processes, being, when long continued, depletive and debilitating.

The sweating process is not applicable to any particular disease by name, but to a particular condition of body which is found in several diseases. This condition is called *plethora* in medical books; it means over-fullness, grossness of the system. It is most frequently found in gouty and rheumatic subjects. All very fat or corpulent persons possess it, of course. It is the result of high living and indolence, or of active alimentation combined with defective depuration. Persons afflicted with that unsightly disorder, *obesity*, can be assisted down to the standard of normal bulk and personal comeliness by this manner of sweating, providing the alimentary supplies are also healthfully curtailed.

The dry-blanket packing is very useful for those invalids who are too feeble to exercise sufficiently to overcome the chill produced by the wet-sheet pack, or other cold applications. With such, too, wrapping for half an hour to an hour is a good preparatory measure for other baths, and it may follow any bath when desirable to thus assist reaction.

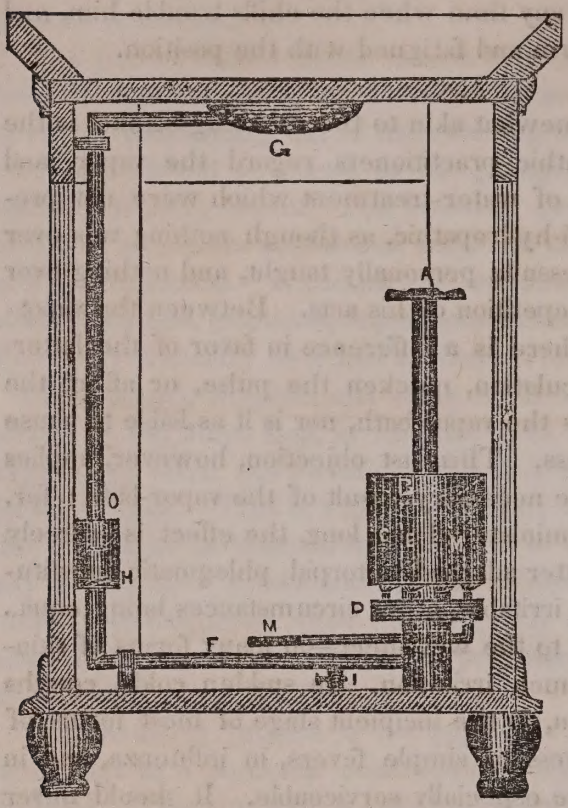
There is another class of invalids still who may find benefit from the dry packing; those who suffer occasionally, and at irregular intervals, severe rigors or chills, proceeding from enlarged liver or spleen, or slight ulcerations or tuberculations of the lungs. Though it will not prevent the chills, it will materially mitigate their severity, and thus

indirectly assist the final removal of the cause. For this purpose the patient may be enveloped at any time when the chills trouble him, and remain until comfortably warm and fatigued with the position.

The Vapor-Bath.—Somewhat akin to the sweating-blanket is the vapor-bath. Some hydropathic practitioners regard the vapor, and shower, and all other modes of water-treatment which were not prescribed by Priessnitz, as anti-hydropathic, as though nothing was ever to be learned save what Priessnitz personally taught, and nothing ever to be done save a routine repetition of his acts. Between the vapor-bath and sweating-blanket there is a difference in favor of the latter It does not disturb the circulation, quicken the pulse, or affect the respiration as much as does the vapor-bath, nor is it as liable to abuse from ignorance or carelessness. This last objection, however, applies rather to the usual than the necessary result of the vapor-bath; for, if not made too hot, nor administered too long, the effect is scarcely ever disagreeable. It is better adapted to torpid, phlegmatic constitutions, than to the nervous or irritable, other circumstances being equa.. It is valuable—yet not equal to the wet-sheet—in many forms of skin-diseases unattended with much irritation. In sudden colds, coughs from suppressed perspiration, in the incipient stage of most forms of rheumatism, in the first access of simple fevers, in influenza, and in mercurial diseases, it is more especially serviceable. It should never be continued to the point of producing dizziness, faintness, nausea, nor great lassitude. Some form of cold-bath should always succeed it, as the shower or plunge. The average time for remaining in a vapor-bath, when the steam is as hot as can be borne without discomfort, is from fifteen to twenty-five minutes.

The "steam doctors" have brought vapor-bathing into unmerited disrepute by overdoing it. Many patients have been "steamed" so long as to produce a degree of muscular relaxation and vital exhaustion, not fully recovered from in years. The process is, in their hands, usually accompanied with hot and stimulating drinks, "composition," "No. 6," etc., and frequently followed by a lobelia emetic; all together making a power of medication which only very robust persons can endure without serious injury. Another error in the steam practice consists in not employing a sufficient amount of cold water after the hot vapor. Generally the patient, when excessively heated, is dismissed with a mere sprinkling of a pint or quart of cold water, when he should have a dripping sheet, plunge, or half-bath. A vapor-bath can be contrived in many ways. The invention of Mr. Jeremiah Essex, of Bennington, Vt., combines as many conveniences as any plan I have seen.

Fig. 172



COLD SHOWER, WARM SHOWER, AND VAPOR-BATH COMBINED.

Fig. 172 is an inside elevation of Mr. Essex's bath, showing the arrangement by which a person can take a cold or warm shower, or a vapor-bath at pleasure. The outside casing is the box of the bath, which may have screen sides, like the common kind; and the tubes below, as they are small, and lying on the floor (the one, F, may run below the floor), can be of no inconvenience. C is a small circular vessel of water surrounding the tube, E, seen in section, and communicates with it by a small opening inside, near its bottom. When the tube, E, is nearly filled, the vessel or chamber, C, contains water to the same height. F is a conducting pipe extending up into the tube, E; and A is the handle of a piston, which extends down into E, having its lower end made to force the water up through the pipe, F, past the valve, H, into the shower vessel, G. This gives a cold shower-bath. To make a warm bath, D is a lamp placed under the vessel, E, which heats the water, when it may be forced up as in the cold shower.

To make a vapor bath, the pipe, M, seen partly in section, is attached near the top of the vessel, C, and it has holes at its lower end to let the vapor escape into the chamber. When used for a vapor-bath, the piston should be withdrawn, and the inside hole in the vessel, C, closed up, when the lamp will generate the steam in a short time. The top of the vessel, C, to the tube, E, is made of a funnel shape, as represented by B, to allow the water to be easily poured in. I is a faucet to drain off the water that may be in the pipe, and there is an attachment to the outside of the valve-case, O, to lift the valve, H, to drain off the water above.

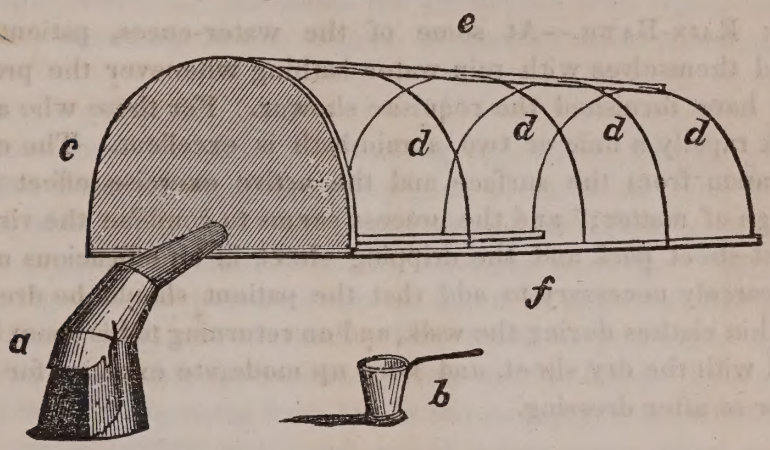
Hot stones or bricks may be used to generate vapor. The patient may sit naked on an open-work chair, with a couple of blankets pinned around the neck; a small tub or a common tin pan, holding a quart of water, is placed under the chair, and red-hot bricks or stones occasionally put into the vessel, so as to keep the vapor constantly rising from the surface of the water.

Another very simple plan is this: Procure a tin boiler of one or two gallons measure, with a tin pipe having two or three joints and a single elbow. The boiler may be heated on any ordinary fireplace or furnace; the pipe can be conducted under a chair or box on which the patient may sit, covered with blankets from the neck downward. The vapor

or steam may be increased or diminished by regulating the position of the boiler over the fire.

The sweating-cradle (fig. 173) is a convenient apparatus for such invalids as are obliged to keep the bed.

Fig. 173.



PERSPIRATORY, OR SWEATING-CRADLE.

Fig. 173 is a drawing of the perspirator, or sweating-cradle. *a* is a tin or copper bent funnel-shaped chimney, with a door, which is seen standing open. The small end of this chimney is open. The large end below has a tin bottom, with a hole in it to receive the little upright tin saucepan, *b*; *c* is the wooden bottom or end of the cradle, with a hole in it to receive the small end of the chimney, into which it fits accurately, but easily; *d d d d* are hoops of wire or wicker; *f* is a long, narrow piece of wood, into which the ends of the hoops are inserted; *e* is a similar piece of wood running along the top, and perforated by the hoops.

When the cradle is to be used, the clothes are to be taken off the bed, and the patient is to lie down on his back, with his head on the pillow. The cradle is then to be placed over him as high as his throat, its wooden bottom being at the foot of the bed, even with the bedstead. It is now to be covered with the whole of the bedclothes, and an additional blanket or two. The clothes are to be neatly tucked in every where, so as not to let out the heat at any point. But they must not hang down over the wooden bottom, and the foot valance of the bed had better be tucked up out of the way. The tin chimney must be kept clear of all clothes. Every thing having been thus neatly prepared, the tin saucepan, *b*, is to be filled three-quarters full with alcohol, and the spirit is to be set on fire. Then, taking hold of the long, straight handle of the saucepan, it is to be carefully let down through the hole in the bottom of the chimney, and the door closed.

THE WAVE-BATH.—This process consists merely in extending the body at length in a swift current of water, the patient holding on to a rope, or some other contrivance, to enable him to keep his position. It helps to make an amusing variety in the watery part of our materia medica, but has no other advantage not obtainable by the douche and plunge.

THE RIVER-BATH.—This amounts practically to an out-door, cold

or tepid plunge-bath, according to the temperature of the water. Invalids should not, as a general rule, bathe in the rivers more than from ten to twenty minutes, when the water is tepid; at all events they should avoid great fatigue and the second chill. When the water is cold the time must be correspondingly diminished.

The Rain-Bath.—At some of the water-cures, patients have amused themselves with rain-water bathing whenever the propitious clouds have furnished the requisite shower. For those who are able to walk rapidly a mile or two, a rain-bath is excellent. The constant evaporation from the surface and the active exercise effect a rapid "change of matter;" and the process seems to combine the virtues of the wet-sheet pack and the dripping sheet in an efficacious manner. It is scarcely necessary to add that the patient should be dressed in light, thin clothes during the walk, and on returning to his room be well rubbed with the dry sheet, and keep up moderate exercise for half an hour or so after dressing.

Fountain or Spray-Bath.—This is a modification of the shower or douche-bath, or rather a combination of both. It consists of a number of small streams thrown off laterally, and diverging as they recede from the fountain. It makes a pleasant and very excellent application to the chest and abdomen, in affections of the viscera of those cavities, when the stronger impression of the douche cannot be borne, or is not indicated. Dyspeptics and consumptives can generally employ it more or less to advantage. It is a good process in pleurodynia, or pain in the side, in lumbago and neuralgia, and in partial palsy or extreme debility of the muscles of any part. Applied to the pelvic region, it is well adapted to excite functional action in atonic states of the organs, amenorrhea, chlorosis, constipation, suppression or retention of urine, etc.

Portable Shower-Bath.—This is a modification of affusion, the water being showered instead of poured over the body, and in effect it amounts to precisely the same thing as the ordinary process of affusion. Convenient machines, holding two quarts or more, for showering by hand, are made by most of the tinsmiths.

The Affusion-Bath.—Pouring water over the neck, chest, and shoulders, the patient standing in a tub when it is desirable not to wet the floor, is called affusion. It is as good as any other form of bath where its indication is simply to cool the body, as in the hot stage of

fevers and active inflammations. Dr. Currie employed affusions extensively, and with remarkable success, in the treatment of scarlet fever, measles, small-pox, and other diseases, at Liverpool, England, half a century ago; but, unfortunately, the medical faculty of the present day, who acknowledge the superior success of his practice, do not see fit to imitate it. Affusions are performed with tepid, cool, or cold water, according to the degree of morbid heat attending the disease.

Towel or Sponge-Bath.—Washing the whole surface of the body with a towel or sponge is a very good prophylactic; and it may be employed in water-treatment as a substitute for various other baths, when the requisite apparatuses for the latter are wanting. The peculiar advantage of this bath is, it can be taken at any time and place, whenever and wherever desired. The towel is preferable to the sponge, because its friction is more perfect and uniform. I should be unwilling to dress, on rising from bed in the morning, without first rubbing the whole surface with a wet towel, unless some other general bath was accessible; and a towel and quart of water can always be had at a hotel or on board a steamboat. Five minutes can never be employed in any more profitable way. That parent can hardly be said to "train up a child in the way it should go," who does not instruct it in the use of a towel wash, or some other bath, every morning, at all seasons of the year.

Wet-Dress Bath.—This is a modification of the wet sheet, enabling the patient to dispense with the services of an attendant—a mode of self-packing. A linen sheet is fashioned into the form of a night-dress, with large sleeves; and after the bed is prepared, the dress can be wet and thrown on; the patient can then get into bed, and wrap himself sufficiently to get a very good warming up. If the bedclothes are not too heavy, nor wrapped too tightly, almost any person, not extremely feeble, can remain in this wet dress all night without the least injury, shocking as the idea may be to our allopathic friends.

Warm and Hot Baths.—These are objected to by some German hydropaths, as not being Priessnitzian, but for no other reason that I can imagine. They are, however, only occasionally employed at the American establishments, not being a regular part of any judicious course of treatment. But for quieting particular symptoms, and allaying excessive nervous irritability, they are sometimes eminently serviceable. In cramps, colic, spasms, and convulsions, they operate ad-

mirably. It sometimes happens that a patient, while under treatment, will, without any unusual exposure, experience all the symptoms of a severe cold, feverishness, headache, sensitiveness to the atmosphere, chilliness, and various aches and pains. All these disagreeable symptoms can generally be removed at once by a hot bath for ten minutes; and if the bath is succeeded by a pail douche, shower or dripping sheet, no appreciable debility will result. Patients who have taken large quantities of mercury, antimony, or nitre, are peculiarly liable to febrile disturbances, and to occasional swellings of the joints and stiffness of the muscles, which a warm or hot bath at once relieves. For all of the purposes above intimated the bath should be as warm as the patient can bear without discomfort; a temperature that is *warm* to one may be *hot* to another; the proper temperature ranges from 90° to 110°.

The Swimming-Bath.—The exercise of swimming is eminently health-preserving, and might with propriety have been treated of in our hygienic department; but as it is also eminently therapeutic in some forms of chronic disease, the subject is not inappropriate here. For that large class of invalids who are consumptive from feeble lungs and contracted chests, and for a still larger class of dyspeptics, who are costive from torpid or contracted abdominal muscles, there is no better exercise than that of swimming. All persons, too, whether invalids or not, ought to know how to swim, on prudential considerations.

As all the exercises involved in the various methods of learning to swim are just as serviceable to the invalid or well person, as those which may be practiced after the art is acquired, and for the purpose of enabling the inmates of hydropathic establishments, where suitable streams or ponds of water can be found, to do themselves two services at once, I copy from one of Fowlers and Wells' publications the following illustrations:

Fig. 174.

SWIMMING WITH A BLADDER.

Various supports may be resorted to while the learner is getting accustomed to the necessary motions. Corks and bladders are convenient. Fig 174 represents a bladder, well blown, and fastened over the shoulders by a rope passed under the chest. Large pieces of cork may be attached to each end of a rope and used for the same purpose. The supports

must always be carefully secured near the shoulders, for, should they slip down, they would plunge the head under water.

Swimming with the plank (fig. 175) has two advantages. The young bather has always the means of saving himself from the effects of a sudden cramp, and he can practice with facility the necessary motions with the legs and feet, aided by the momentum of the plank. A piece of light wood, three or four feet long, two feet wide, and about two inches thick, will answer very well for this purpose. The chin may be rested upon the end, and the arms used, but this must be done carefully, or the support may go beyond the young swimmer's reach.

Fig. 175.

SWIMMING WITH THE PLANK.

The rope (fig. 176) is another artificial support, which has its advantages. A rope may be attached to a pole, fastened—and mind that it be well fastened—in the bank, or it may be attached, as shown in the engraving, to the branch of an overhanging tree. Taken in the hands, the swimmer may practice with his legs, or by holding it in his teeth, he may use all his limbs at once The rope, however, is not so good as the plank, as it allows of less freedom of motion, and the latter might easily be so fixed as to be laid hold of by the teeth, and held securely.

Fig. 176.

SWIMMING WITH THE ROPE.

Wherever a descending grade can be found, the learner can soon become a good swimmer, with no artificial assistance, by wading in the water up to the neck, and then paddling to the shore.

In swimming, the feet should be about two feet below the surface. The hands should be placed just in front of the breast, pointing forward, the fingers kept close together, and the thumb to the fingers, so as to form a slightly hollow paddle. Now strike the hands forward as far as possible, but not bringing them to the surface; then make a sweep backward to the hips, the hands being turned downward and outward: then bring them back under the body, and with as little re-

sistance as may be, to their former position, and continue as before. The hands have three motions—First, from their position at the breast, they are pushed straight forward; second, the sweep round to the hips, like an oar, the closed and hollowed hands being the paddle portion, and their position in the water and descent serving both to propel and sustain the body; and, third, they are brought back under the body to the first position.

Having learned these motions by practicing them slowly, the pupil should proceed to learn the still more important motions of the legs. These are likewise three in number: one of preparation, and two of propulsion. First, the legs are drawn up as far as possible, by bending the knees, and keeping the feet widely separated; second, they are pushed with force backward and outward, so that they spread as far as possible; and, third, the legs are brought together, thus acting powerfully upon the wedge of water which they inclosed.

Some works upon swimming advise that the propelling stroke of the arms and legs should be used alternately; but this is not the method used by good swimmers, or by that best of teachers, the frog, of whom I would advise all new beginners to take lessons. It is better that the feet should be brought up at the same time that the hands are carried to their first position; the propelling strokes may then be combined so as to give the body its most powerful impetus, as a boat is rowed best with simultaneous strokes.

The motion in the water should be as straight forward as possible, and the more the head is immersed the easier is the swimming. Rising at every stroke—*breasting*, as it is called—is both tiresome and inelegant.

All these movements should be made with slowness, and deliberately, without the least flurry. The learner will soon breathe naturally, and as the motions are really natural he will not be long in acquiring them. If he draw in his breath as he rises, and breathe it out as he sinks, he will time his strokes, and avoid swallowing water. Those who have been accustomed to fresh water must be particularly careful when they go into the sea, the water of which is very nauseous.

Fig. 177.

PLUNGING OR DIVING.

In leaping into the water, feet first, which is done from rocks, bridges, and even from the yards and masts of lofty

vessels, the feet must be kept close together, and the arms either held close to the side, or over the head. In diving head foremost, the hands must be put together, as in the engraving (fig. 177), so as to divide the water before the head. The hands are also in the proper position for striking out.

Treading the water (fig. 178) is a favorite position, and useful as a means of resting in swimming long distances. The position is perpendicular; the hands are placed upon the hips, as in the vignette, or kept close to the side, to assist in balancing the body, being moved like fins at the wrist only. The feet are pushed down alternately, so as to support the head above water; and the body may be raised in this way to a considerable extent. While in this position, if the head be thrown back, so as to bring the nose and mouth uppermost, and the chest somewhat inflated, the swimmer may sink till his head is nearly covered, and remain for any length of time in this position without motion, taking care to breathe very slowly.

Fig. 178.

TREADING WATER.

In swimming on either side (fig. 179), the motions of the legs have no alteration, but are performed as usual. To swim on the left side, lower that side, which is done with the slightest effort, and requires no instructions. Then strike forward with the left hand, and sideways with the right, keeping the back of the latter to the front, with the thumb side downward, so as to act as an oar. In turning on the other side, strike out with the right hand, and use the left for an oar. To swim on each side alternately, stretch out the lower arm the instant that a strike is made by the feet, and strike with the other arm on a level with the head at the instant that the feet are urging the swimmer forward; and while the upper hand is carried forward, and the feet are contracted, the lower hand must be drawn toward the body. This method is full of variety, and capable of great rapidity, but it is also very fatiguing.

Fig. 179.

SIDE SWIMMING.

Thrusting (fig. 180) is a beautiful variety of this exercise, and much used by accomplished swimmers. The legs and feet are worked as

in ordinary swimming, but the hands and arms very differently. One arm, say the right, should be lifted wholly out of the water, thrust forward to its utmost reaching, and then dropped upon the water with the hand hollowed, and then brought back by a powerful movement, pulling the water toward the opposite armpit. At the same time the body must be sustained and steadied by the left hand, working in a small circle, and as the right arm comes back from its far reach to the armpit, the left is carrying in an easy sweep from the breast to the hip. The left arm is thrust forward alternately with the right, and by these varied movements great rapidity is combined with much ease.

Fig. 180.

THRUSTING

Swimming on the back (fig. 181) is the easiest of all modes of swimming, because in this way a larger portion of the body is supported by the water. It is very useful to rest the swimmer from the greater exertion of more rapid methods, and especially when a long continuance in deep water is unavoidable. The swimmer can turn easily to this position, or if learning, he has but to incline slowly backward, keeping his head on a line with his body, and letting his ears sink below the surface. Then placing his hands upon his hips, he can push himself along with his feet and legs with perfect ease and considerable rapidity.

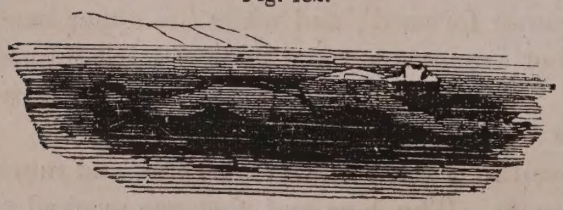
Fig. 181.

SWIMMING ON THE BACK.

The hands may be used to assist in propelling in this mode, by bringing them up edgewise toward the armpits, and then pushing them down, the fingers fronting inward, and the thumb part down. This is called "winging."

The hands may be used at discretion, the application of force in one direction, of course, giving motion in the other; and the best methods are soon learned when once the pupil has acquired confidence in his buoyant powers.

Fig. 182.



FLOATING.

Floating (fig. 182) is so useful a part of the art of swimming, that it cannot be

too soon obtained. In salt water, nothing is easier; and in fresh, to most persons, it requires but the slightest exertion. The feet should be stretched out, and the arms extended upward, so as to be at least as high as the top of the head, and under water. The head must be held back, the chin raised, and the chest expanded. The hands will easily keep the body in this horizontal position, and by breathing carefully a person may float at ease for hours. Could a person, unable to swim, but have the presence of mind to take this position, he could scarcely drown.

To *beat the water*, the legs are raised out of it alternately while swimming on the back, the body being sustained by the hands.

While swimming on the breast, one leg may be carried backward, and taken hold of by the opposite hand, and the swimming continued with the leg and hand kept unemployed. This is said to be useful when taken with the cramp in one leg.

Swimming under water should be done with the eyes open. If you would swim midway between the bottom and the surface, make the strokes of the arms and the hands inward, *i.e.*, toward you, as if you would embrace the water by large armfuls, keeping the thumbs turned rather downward. These are most important manœuvres. You are thus enabled to pass unseen across a river or branch of water, or to search for any thing which has fallen to the bottom, and also to rescue any one who is drowning. Beating, and swimming under water should not be attempted until the swimmer becomes expert in the other processes.

Eye and Ear Baths.—Various contrivances have been employed to bring the bathing processes to bear on the eyes and ears more powerfully than by means of wet cloths. The best are ascending, or obliquely ascending douches or showers. The force should always be moderate, but may be applied for a considerable time. They are useful in chronic inflammation, unattended with much pain or intolerance of light, partial blindness or deafness from torpor of the nerves or obstruction of the vessels, weakness of vision without preternatural sensibility, specs, incipient amaurosis, gathering in the ears, etc.

The Nasal-Bath.—Sniffing water up the nostrils, or drawing it so far into the nasal cavities as to be ejected by the mouth, is very useful in chronic inflammation, and in a relaxed or weakened state of the mucous membrane of the nose. In common colds, and catarrhal affections, the process is salutary. For debility, relaxation, or dryness of the mucous membrane from the use of snuff, it may be employed perseveringly to advantage. For nose-bleeding, the water should be

as cold as possible. After the removal of soft polypi from the nostrils, iced-water should be employed frequently to constringe the vessels In employing the nasal-bath, the water should be taken up by gentle, full inspirations, not by a sudden jerking motion, as this often gives pain and increases irritation.

The Oral, or Mouth-Bath.—Gargling the mouth with pure cold water should not be omitted in inflammatory affections of the throat or palate. For sore or swelled gums, toothache, hoarseness, and all vitiated secretions, cool or cold water should be frequently held in the mouth until it becomes warm, and often repeated. In apthous or cankerous affections of the mou h, water should be employed in the same way. Relaxation or falling of the *uvula*, or soft palate, can generally be relieved or cured by gargling perseveringly with the coldest water, or by holding lumps of ice in the mouth. Tobacco-chewers should first abandon the filthy habit, and then employ the cold mouth-bath to restore the natural sensibility of the mucous membrane, and a healthful secretion of saliva.

The Arm-Bath.—For old ulcers, and recent or chronic swellings of any part of the arm, holding the affected part in cold water from fifteen minutes to an hour, will greatly assist in healing the ulcer or absorbing the swelling. Eruptive and rheumatic affections, in fact, all morbid conditions of the upper extremities, attended with preternatural heat, should be treated locally, by holding the part diseased in cool or cold water, or wrapping it in wet cloths, to be frequently changed, until the temperature becomes natural. In erratic complaints, which are liable to change the seat of inflammation, as with gout, rheumatism, especially mercurial rheumatism, care should be taken to discontinue the cold application as soon as the morbid heat is thoroughly subdued. When cold applications increase the pain, warm or hot may be substituted.

The Hand-Bath.—Habitual coldness of the hands, or numbness, is relieved by holding them frequently in very cold water, rubbing them smartly at the same time. Warty excrescences are often cured by chilling the hands severely by holding them a long time in the coldest water.

The Finger-Bath.—This is employed for felons or whitlows, and other similar affections. The temperature of the water should, in all cases, be that which feels most agreeable during its application.

THE LEG-BATH.—The lower limbs are much more liable to chronic swellings, ulcers, gouty and rheumatic enlargements, etc., than the upper, on account of the adverse relation of the force of gravitation to the weakened vessels. The knee-joint is occasionally affected with a chronic inflammation of its membranes—*synovitis*—for which the leg-bath is serviceable. A tin vessel, shaped something like a boot, large and long enough to take in the leg above the knee, is a convenient means of administering this bath. If the patient is crippled, an India-rubber bag, constructed with straps, by which it may be hung upon a chair, or fastened to the side of the bed, is more convenient. It may be employed from fifteen minutes to one hour. There is no danger of producing metastases, or driving the disease to internal parts, in any form of rheumatic or gouty inflammation, provided the application is not continued beyond the point of reducing the temperature to the natural standard.

THE DROP-BATH.—This process is not often resorted to, nor is it even mentioned in some hydropathic books. Still it is sometimes serviceable, and ought to be understood. Wiess gives the best description of it:

"This term is applied to single drops of water falling from a height of several fathoms. A vessel is filled with *very cold* water, and furnished with a small aperture, through which the water passes in the form of drops. The small aperture should be partially closed by a plug, to prevent the drops from following each other in rapid succession. By these means their operation is considerably increased, and it becomes yet more potent if we allow the drops to fall upon a particular part at certain periods, and rub the part during the intervals. The reaction about to commence will indeed be thus interrupted, but will afterward make its appearance in a more powerful and energetic form.

"The violent excitement and irritation of the nervous system produced by these baths, render it necessary to restrict the use of them to half an hour; nor are they, indeed, adapted for vital parts, or such as are abundantly supplied with nerves.

"They are often used with more effect in obstinate and chronic cases of paralysis than the douche or affusion, with which they may alternate. Powerful and continued friction with a horse-hair glove is never in this case to be neglected after the baths."

THE AIR-BATH.—This is not quite a *water*-cure process, but as air, as well as water, in all its adaptations to health-producing purposes, belongs to the Water-Cure system, the air-bath may be properly con

sidered in this place. It consists of the sudden exposure of the whole body, in a state of nudity, to cool or cold air, or even a strong current. It is employed under precisely the same regulations as a cold-water bath. It is certainly a very invigorating process, and may always be safely applied to the whole body when the body is in a sensible glow or when the temperature is above the natural standard, and generally, also, when the temperature is at the natural standard, provided there is no sensation of chilliness present. It is useful, moreover, to expose any painful or inflamed part to cold air, at any time when the sensation of cold is agreeable. The air-bath has sometimes followed the wet-pack, the same friction, exercise, etc., being employed to keep up comfortable reaction after it.

Sitting naked in a cold room for from ten minutes to an hour has been practiced by some persons as a hygienic measure. There are few persons who cannot bear a moderate degree of such exposure to advantage. Those of feeble circulation would do better to walk, jump, dance, or exercise in some other way. Franklin, whose practical sagacity and keen observation have attained a world-wide celebrity, accustomed himself to sit and read half an hour or an hour, on rising in the morning, before dressing.

Walking the room in a state of entire nudity, has been resorted to for the purpose of promoting sleep in very restless, dream-disturbed individuals, and it is said to conduce remarkably to quiet and refreshing sleep. I have known the experiment tried frequently, and always with good effect.

Patients suffering from fevers and inflammatory disorders, under the popular practice, generally have their sufferings greatly aggravated by too much bed-clothing. From a vague apprehension of catching cold, they are half stifled with excess of heat. There is no danger whatever of cold air in any quantity or degree in such cases, so long as the whole surface is preternaturally hot

Fomentations.—Warm and hot fomentations are useful in a variety of morbid conditions. They are sedative and relaxant. and are appropriate in cases of spasmodic pains, muscular contractions, periodical headaches, hysterical convulsions. etc., when the state of the system is not actively inflammatory, nor the local part preternaturally hot. In the latter case, cold applications are the most efficacious to alleviate pains or cramps. A very good and perfectly safe rule for all practical purposes, in the selection of cold, cool, warm, or hot local applications, is the sensations of the patient. That temperature which feels the best is the best. This rule will apply to cramps, spasms, colic, tooth-

ache, backache, erratic and irregular pains from various chronic diseases, lumbago, pleurodynia, etc.

But it must be recollected that all very warm or hot applications are always for occasional, never for constant employment. They are to be regarded in every case as temporary expedients, specially intended to quiet pain, subdue local irritation, and remove irregular muscular contractions, or as adjuvants to the general curative course; and rightly managed with this view, they are highly important as well as pleasant resources. They produce temporary relaxation, but no permanent debility when used in connection with more or less cold bathing, as would be the case were they employed alone.

The French method of hot fomentations, so highly commended by Dr. Gully, is as efficacious and perhaps more convenient than any other in use: A piece of flannel thrice-folded is put into a dry basin, and very hot water poured on it, sufficiently to soak it. The flannel is then put into the corner of a towel, which is twisted round it, and wrung until the flannel is only *damp*. It is taken out of the towel, and immediately laid over the part to be fomented, and upon it is placed a double fold of thick flannel, dry, or part of a light blanket. The patient then, if it be the abdomen which is fomented, draws the ordinary bedclothes over him, and remains quiet for five or six minutes, when another flannel freshly wrung out is applied, the former one being withdrawn.

The cloths seldom require changing more than three or four times. Generally relief is obtained in ten or fifteen minutes. I have very often witnessed the best effects from this fomentation in nervous and dyspeptic headaches, in *globus hystericus*—the sense of suffocation often accompanying hysteria, and in painful menstruation. It is also frequently effectual in relieving, for the time, asthmatic fits, convulsions from teething or indigestion, neuralgia in the head or face; it will generally also produce relaxation of the bladder or bowels, in cases of retention of urine and severe constipation. In those severe derangements of the stomach and liver, attended with excessive nausea, severe retching and vomiting, intolerance of food and drink, etc., its use, in connection with the pouring of cold water over the back of the head and temples, will usually afford prompt relief, as I have many times experienced. For all these purposes the fomenting cloth should be large enough to cover half or two thirds of the surface of the abdomen.

There are some delicate invalids, of bloodless skin and feeble vitality, who find it extremely difficult to get comfortably warm in the wet sheet, and such may be very much assisted by a fomentation to the abdomen for five minutes before and after the pack.

Rest, and not exercise, should succeed the application of hot fomentations, except when they are employed as an auxiliary to and followed by a cold bath.

I have thus far spoken only of hot fomentations to the abdomen; and indeed in nine cases out of ten where this process is indicated at all, the place and manner described will answer all purposes. Yet in various local, spasmodic, or periodical pains they may be applied as near the part affected as possible. In affections of less severity, wet cloths of any kind, applied as hot as can be borne, will prove sufficient.

BANDAGES.—These may be local *warming* or *cooling* processes, as indicated, and answer all the purposes of the awkward, bungling, and expensive machinery of liniments, lotions, poultices, embrocations, blisters, rubefacients, epispastics, cuppings, issues, burnings, and other external drug appliances of the old school.

A *warming bandage*, or compress, is simply one or more folds of linen cloth, wet in cold water, applied to the part affected, and covered with a dry cloth or other material, to retain the animal heat.

A *cooling bandage*, or compress, is a similar wet application without the dry covering, or with the covering so light as to allow the animal heat readily to pass off. In both cases the cloth is to be renewed as often as it becomes dry. As usually managed, these compresses are both cooling and warming, the first impression being cold, and the reaction leaving a glow upon the surface; but they can be made to produce a constantly cooling effect by very lightly covering and frequently changing them, or a very heating effect by covering them with flannel or other non-conducting material.

Coarse linen cloth, as common crash toweling, is the most suitable cloth to be wetted; and for the dry covering, the same material, or any common muslin, will answer in warm weather, and soft flannel in cold weather. India rubber, gutta percha, and oiled silk have all been in repute, and a few years ago were very generally employed for coverings. I regard them all as objectionable. They do indeed serve to prevent evaporation, and retain more perfectly the animal heat, and they also keep the part moist longer; and they seem, too, to have a more drawing or derivative influence, if the more ready production of eruptions or boils indicates such influence. But they retain the effete perspirable matter which should pass off; and their non-conducting, or non-electric property renders them relaxing and weakening to the cutaneous function.

It seems to me that, *in all cases*, cloth coverings are the best. If they produce a less number of boils or less painful eruptions, the cure

will nevertheless be as prompt and even more perfect. When the skin is torpid and cold, Canton or soft, light, woolen flannel answers every purpose; and if necessary, for very feeble patients who are unable to take much exercise, two or three thicknesses may be used.

THE CHEST-WRAPPER.—This is advantageously employed in nearly all chronic diseases of the chest, as incipient consumption, bronchitis, in the very early stage of hydrothorax, or dropsy of the chest, spasmodic or periodical asthma, etc. It may be made of crash toweling, or two or three folds of muslin, and fitted, with arm-holes, loosely to the trunk of the body from the neck, nearly or quite down to the hips. The outside covering is a similar wrapper, made of the same material, or of flannel. The inner, or wet wrapper, is tied as tightly around the body as desired by tapes, which are attached to the top, bottom, and middle, and the outside or dry wrapper is either tied around it, or the inner one is buttoned to the outer.

There is some discrepancy in the views of different hydropaths, as to whether the wet cloth should extend entirely around the body, or a few inches over the spine be left uncovered. Here again, as in most of the vexed questions which occur in hydropathic bathing, the feelings of the patient are our best guide. If the wet cloth over the spine does not produce any disagreeable chilliness, pain, or uneasiness, different from what is experienced when the partial wrapper is worn, I would have it entirely encircle the trunk; otherwise a space of from four to six inches in the center of the back should be uncovered by the wet cloth.

This may be worn day and night for several weeks, provided it produces no uncomfortable chilliness during the day, and does not become so warm and dry as to make the patient restless during the night. In the former case it should only be worn during the warmest part of the day, or during the time allotted to exercise, or from the morning bath until noon, or from the forenoon bath until evening. In the latter case it may be worn during the day, and omitted at night. It usually requires wetting when worn constantly, in the morning, toward noon, toward evening, and at bedtime.

THE ABDOMINAL WRAPPER.—The *wet girdle*, or abdominal compress, as this is generally called, is more generally employed than any other local hydropathic application. Derangements of the digestive organs are so prevalent nowadays that those who do not thus complain are exceptions to the general rule, and for all of these complaints this

bandage is appropriate. It is also serviceable in all chronic diseases of the liver, and in acute diseases of the abdominal viscera, as inflammation of the stomach and bowels, cholera, dysentery, cholera morbus, diarrhea, etc., it is always employed with benefit.

A great deal of ingenuity has been wasted in contriving abdominal compresses. But the best invention of all is three yards of common crash towel cloth. One half of this is wet, and moderately wrung: the wet end is applied to the side of the abdomen, then the bandage is passed across the abdomen, and around the body, followed by the dry half. This brings two folds of the wet part over the front of the abdomen, and one behind. Whether it is to be extended entirely around the body, must be determined by the rule mentioned as applicable to the chest-wrapper. The proper crash cloth is from twelve to sixteen inches wide, and covers the trunk from the short ribs to the hips, descending a little over the latter. As with the chest-wrapper, it may be worn constantly or occasionally. It should never be applied so tightly as to hinder in the least free respiration. It may be kept in place by tapes or pins.

This bandage is employed more or less in all cases of dyspepsia. liver complaints, constipation, paralysis of the lower limbs, affection of the pancreas, spleen, kidneys, and bladder, obstructions of the mesenteric glands, all forms of mismenstruation and female weakness, in a word, in all chronic morbid conditions of the abdominal and pelvic viscera, and in all states of weakness or relaxation in their ligaments or muscles. Persons who have weakened the abdominal muscles and viscera by sedentary habits and crooked bodily positions, experience great benefit from its use.

Friction.—Hand-rubbing, towel-rubbing, rubbing the skin over the wet or dry sheet, and with a flesh-brush or horse-hair gloves, are among the accompaniments of the bathing processes. Their object is to assist reaction and promote capillary circulation. As a general rule, patients should practice as much self-rubbing as convenient, at the same time that they are assisted by the attendant, because the exercise of so doing is an advantage of itself. As a general rule, too, the amount of friction in each case should be proportioned to the bloodlessness and torpor of the skin; and another general rule may be stated in relation to friction, which is, that it should be active and rapid, rather than harsh or scraping; rather magnetic than forcible. Some invalids, on the mistaken notion that the harder they are rubbed the more will they become vitally magnetized, keep the attendants at work, if they be good-natured, and object not, until completely exhausted; hence

a physician should always instruct the attendants well in this particular duty.

Temperature of Baths.—Hot, warm, tepid, cool, and cold are only employed as approximate terms. Water that feels hot to one may be only warm to another, and what is cold to one is sometimes tepid to another. The sensations of the patient are generally a better guide for regulating the temperature of a given bath than is the thermometer; still, the latter is indispensable in many cases, and in all convenient. As a general rule, the more feeble and delicate the patient, the more strictly should we follow the test of his feelings in administering tepid, warm, cool, or cold baths. When the circulation is vigorous, and the vital temperament well developed, we may regulate any bath with sufficient precision by the thermometer. It is a useful precaution, when commencing treatment with very susceptible patients, to test their sensibility to different temperatures of water, after which the physician or patient can prescribe them thermometrically. Some Water-Cure books seem to make it an especial point to be thermometrically exact in directing particular baths for given diseases, as for example: sitz-bath, at 59°, shallow-bath, at 63°, half-bath, at 74°, etc. These nice distinctions are not to be arbitrarily imitated, but may be regarded as landmarks, to keep us within reasonable bounds.

Baths may be distinguished into cold, below 65° Fahr.; tepid, 65° to 80°; warm, 80° to 98°; and hot, above 98°. But a better division may be made thus:

Very cold,	32° to 40°.	Tepid,	72° to 85°.
Cold,	40° to 55°.	Warm,	85° to 98°.
Cool,	55° to 65°.	Hot,	98° to 115°.
Temperate,	65° to 72°.	Vapor,	98° to 125°.

The term *moderately* tepid, warm, cool, or cold, when occurring in this work, means some degree between the bath named and temperate, or the next bath in the scale, reckoning toward temperate; thus moderately hot would mean a temperature between 98° and 85°, etc.

Duration of Baths.—There is the same mystical yet unmeaning exactness about the time of continuing a given bath, to fulfill a particular indication, in many Water-Cure books, that there is about the temperature. But here, again, we have better guides than seconds and minutes, in the feelings of the patients and in the effects produced. It

is true an experienced hydropath can, on examining a patient, determine at once about the proper length of time to administer most of his baths; but this time should always have a nearer relation to the condition of the patient, and the sum total of all the treatment prescribed, than to the name of the disease. A general rule may be laid down, that all patients should limit all baths to a period short of producing any very depressing chill; and never continue any one to the point of producing a second chill after the reaction has once taken place in the bath. In home-treatment the safer way is to incline to frequent and short baths, rather than few and long.

General Rules for Hydropathic Bathing.—1. No bath should be taken on a full stomach. General baths, as the wet-sheet, plunge, douche, shower, etc., should not be taken until the process of digestion is nearly or quite completed—from three to four hours after a full meal. Local baths, as the hip, foot, hand, leg, etc., may be taken in an hour after a light, and two hours after a hearty meal. Bandages may be applied at any time.

2. Patients should not eat immediately after a bath. An hour is soon enough after a full, and half an hour after a local bath.

3. All patients who are able should exercise moderately previous to a bath, unless at the bath time the body is already in a warm glow; and after a bath, according to muscular strength. The more exercise short of absolute fatigue the better. By absolute fatigue I mean that degree of exhaustion which is not readily recovered from on resting.

4. In very warm weather the most active exercise should be taken before breakfast; and during the heat of the day it should not be crowded beyond what is perfectly agreeable.

5. No strong shock should ever be made upon the head. A shower or pail-douche, poured but not dashed on, is not objectionable for those who enjoy a tolerably well-balanced circulation, and are not subject to nervous headache.

6. Profuse perspiration, or great heat of the body, is no objection to any form of cold bath, provided the body is not in a state of exhaustion from over-exertion, nor the breathing disturbed. This point is generally misunderstood by physicians, and medical books of the old school are wholly in error about it. The majority of people imagine that the sudden transition from cold to hot is dangerous. The danger is all on the other side—in applying cold when the body is already too cold. Again, it is thought that a cold bath, when the body is dripping with sweat, will *check the perspiration*, and do immense mischief by driving it in! This is a mere phantasy. The matter of perspiration is a

viscid, waste, dead, effete material, and its presence on the surface has nothing whatever to do with the effect of a cold bath. It may be as safely washed off with cold water when the body is hot, as can any other extraneous matter adherent to the surface.

But persons *are* often injured by going into cold water when the body is hot and perspirable. Granted. I have known several young men made cripples for life by this practice. Now what is the explanation? Either the body was too cold, or in a state of exhaustion, or the respiration was materially disturbed, or the stomach was loaded, or all of these conditions existed together. There is a reciprocal relation between circulation and respiration, which cannot be greatly disturbed without injury. If a person jumps into cold water when out of breath from violent exercise, he endangers his health, because the intimate sympathy between the action of the heart and lungs will prevent reaction to the surface, and the result is internal congestion. Under all other circumstances, a warm or hot skin is favorable to any cold application, while the state of perspiration is a matter of no sort of consequence one way or the other. Dr. Johnson remarks: "Being in a state of perspiration is no objection to taking any bath, except the sitz, foot, and head-bath." If the rules I have laid down are duly observed, there can be no force in the objection of Dr. Johnson.

7. When full treatment is prescribed, as three, four, or five baths a day, the patient should take the most powerful, or those which produc the greatest shock, on rising, and in the early part of the day.

8. Wetting the head, and even the chest, is a useful precaution before taking any full bath, and especially important for patients who are liable to head affections.

WATER-DRINKING.—The indiscriminate drinking of large quantities of water, as has been the custom at some establishments, is not to be commended. The amount that can be taken to advantage varies greatly according to disease, temperament, exercise, diet, etc. Persons of large chest and abdomen, of florid complexion and active capillary circulation, can drink with satisfaction, and require, while under treatment, a free use of water as drink—from twelve to twenty tumblers. On the contrary, those of thin, spare body, nervous temperament, and especially if the skin appears bilious, and the pores, as it were, glued together, cannot take, with profit, more than three to six tumblers daily. In the former case the water is rapidly absorbed from the stomach, and thrown off by the skin; in the latter case it lies, as it were, like a dead weight in the first passages, and is finally carried off mainly by the kidneys.

Considerable allowance must also be made for the amount of exercise the patient can take, and the kind of food partaken of. The greater the amount of exercise, the more cutaneous transpiration, and the more water required. Those who use much animal food, salt, or other seasonings, grease of any kind, or concentrated farinaceous food, require a much larger quantity of water—other circumstances being equal, than those who restrict themselves to a plain vegetable diet. Patients should always drink to the extent of thirst; but for a general rule while under treatment, water should be taken most freely early in the morning, after the bath, and again about the middle of the forenoon; a less quantity still in the afternoon, and little or none in the evening. Very little should be drank at meals.

There are some few dyspeptics whose stomachs are so contracted and sensitive, whose livers are so torpid, and whose capillary circulation so diminished, that even a single tumbler of cold water produces a painful heaviness and distressing chilliness of the stomach. Such invalids should begin with half a tumbler, or even less, and gradually but carefully increase the quantity, as it can be borne without producing unpleasant sensations. In such cases, too, the water drank should never be very cold; the best temperature is from 55° to 65°.

Drs. Gully, Johnson, Wilson, and Rausse, very severely and very justly repudiate the indiscriminate practice of large water-drinking, which is so highly and extravagantly recommended in some works on Water-Cure. I have seen not a little mischief result from it; in home practice water-drinking is particularly liable to be overdone. Some persons have boasted of the "ravenous appetite" produced by drinking twenty or thirty tumblers of water a day; but I cannot understand the advantage of ravenous appetites; they are generally indicative of excessive morbid irritation in the stomach.

The rule for those who have not an intelligent hydropath to advise with, is to follow the sensations of the stomach; take all that produces pleasurable sensations, and no more. More or less water should always be taken after each bath. Exercise should succeed water-drinking, and, as already intimated, it should be proportioned to the amount of water taken.

Lavements and Injections.—These are used as cleansing and relaxing, or tonic and contracting processes. For the former purposes tepid or warm water is employed, and for the latter cool or cold. On the first attack of acute diseases of the bowels, cholera, dysentery, colic, diarrhea, etc., copious tepid injections should be promptly resorted to, and succeeded, after the alimentary canal is well cleansed, by

cool injections. In obstinate constipation from debility, cold injections should be employed daily until general treatment and diet can reproduce the ordinary peristaltic action. In hemorrhoids an injection of a small quantity of cold water just previous to the expected movement of the bowels, greatly assists the healing process. Chronic diarrhea generally requires cool or cold injections occasionally. In all chronic mucous or muco-purulent discharges from the bowels, bladder, urethra, or vagina, injections of a temperature suited to the susceptibility of the part affected, or the degree of inflammation, are an indispensable part of the treatment. In gleet, leucorrhea, prolapsus, and menorrhagia, they should be freely used as strengthening processes. After parturition the vagina should be cleansed with a cool injection. The most convenient instrument for self-treatment is the pump syringe for the bowels. The curved tube vaginal syringe is indispensable for females. In some affections of the uterus and vagina, a small tube speculum is necessary to be introduced to enable the water to come in contact with as large a surface as possible while employing the sitz-bath. The Union India Rubber Company, of this city (office 19 Nassau Street), has just brought out an admirable apparatus for throwing water up the rectum or vagina with any degree of force required. It consists of a bag, holding a gallon or more, which is filled with water and elevated, by hanging on a hook or nail, six, eight, or ten feet. The force of the stream is regulated by pressure on a long tube which conveys the water from the bag or fountain; and to the end of this tube suitable pipes are adjusted to convey the water up the vaginal or intestinal passage. This apparatus is cheap and not liable to get out of order.

CHAPTER III.

CRISES.

Doctrine of Crisis.—The doctrine of crisis is as ancient as Hippocrates. Acute diseases, when left to themselves, often terminate by some spontaneous evacuation; and chronic diseases, when left to the unaided remedial powers of nature, are frequently resolved by some external eruption or internal abscess. Under water-treatment, acute diseases are generally relieved by mild yet effectual functional efforts of all the excretory organs, unattended with any great commotion in

the organism, or strong determination to any one emunctory, or sinking of the vital powers, which can be called in any sense critical.

But with chronic diseases the case is often very different. Many cases, indeed, recover without any disturbance which can properly be denominated a crisis; others recover after repeated disturbances, more or less severe, which may be called critical efforts; and others, after one or several paroxysms of general or local excitement, attended with some profuse evacuation, severe boils or eruptions, a general feverishness, or an aggravation of old, half-forgotten aches, pains, or other local affections.

Forms of Crises.—The most common forms in which crises, or critical efforts, present themselves are, *diarrhea*, *boils*, and *general feverishness*. Boils present all manner of appearances from the hard, diffused, inflammatory swelling, with scarcely any suppurating point, to the deep, fully-matured, sub-cutaneous abscess; there may be one or several at the same time, or they may succeed each other for weeks or months, and be very painful, or scarcely troublesome. Those of full habit, sanguine temperament, and active external circulation, are most subject to boils and eruptions.

Diarrheas, when purely critical, come on without any accidental or unusual exposure or dietetic error, and continue with greater or less severity from three days to two weeks. There is not usually much pain, griping, or distress of any kind in the bowels, but the evacuations are thin, watery, and frequent; generally there are from three to six or eight motions in twenty hours. In persons who have been most subject to piles, the motions will be most frequent, and attended with considerable *bearing down* or *dragging* sensation about the lower bowel, and the discharges will exhibit a great amount of mucous or slimy matter, often intermixed with blood. A critical looseness of the bowels is not attended with debility like an ordinary diarrhea; if long continued, there is, of course, some degree of languor, but then the discharges are very easily checked by hot-sitz-baths and cold injections. Those who have long labored under derangements of the digestive organs, and particularly those with torpid livers and constipated bowels more especially, if these conditions are complicated with pale, yellow, bloodless skin, and shriveled, superficial, capillary vessels, are most liable to critical evacuations by the bowels; and, as far as my observation extends, they are invariably beneficial, always being succeeded by a decided sense of improvement in the patient's entire physiological condition.

The term "feverishness," does not very well express the other com-

mon form of critical action, but I know of no better one to employ. It is characterized by more or less of the symptoms which attend an attack of simple fever, but they appear in a more disguised and irregular form. There is chilliness and heat, languor, depression, backache, headache, general restlessness, great sensitiveness to cold, etc., etc., but, unlike the same symptoms in a paroxysm of simple fever, they do not follow each other in the order of the *cold*, *hot*, and *sweating* stages. This febrile disturbance continues from one day to a week, when, unless aggravated by improper treatment, the body recovers its balance of action and feeling, and the patient feels himself advanced at least one step on the road to health. Other manifestations of critical disturbance, as eruptions, rashes, profuse sweatings, copious discharge of urine, vomitings, free evacuation of bile, etc., stiffness of the muscles, pain and swelling of gouty and rheumatic joints, fetid perspirations, where compresses are worn, etc., occasionally occur, but require no especial management save moderating or suspending a part or all of the cold treatment, as the general disturbance of the system is more or less violent, and employing soothing applications, as indicated.

Management of Crises.—The management of crises is not difficult; generally all that is required is an omission of some part or all of the stronger baths, according to the violence of the crisis, and the use of such mild and soothing appliances as are most agreeable to the patient. The patient should exercise or rest, as he finds either most comfortable, diet very simply, and use water locally to boils, eruptive or inflamed parts—of the temperature that feels most pleasant. If there is violent headache, it may be soothed with the hot abdominal fomentations. If the whole body is sore, tender, restless, and irritable, a hot bath should be taken for ten minutes; and if diarrhea progresses so far as to materially weaken the patient, the hot fomentation, or hot sitz-bath, with cold injections, should be employed. Full treatment should not be resumed until the critical disturbance is entirely abated.

Rationale of Crisis.—I do not know that it is possible to explain satisfactorily to the professional or non-professional reader the true rationale of critical action, since all the language employed in relation to vital laws, organic instincts, remedial actions, etc., is necessarily more or less figurative. Authors on Water-Cure all agree that crises do occur; some regard them as of general occurrence, the cures without such phenomena being exceptions to a general rule; others contend that cures can generally be made without crises, these being the ex-

ceptions; and stil others regard the majority of the crises as the result of injudicious or excessive treatment.

It is perfectly certain that many bad cases of chronic disease are cured without any appearance of crises whatever; it is equally certain, in my judgment, that some few cases are utterly incurable without the production of a decided crisis; and I am fully convinced that in many cases crises are rendered unnecessarily and even dangerously severe by excessive or injudicious treatment—generally too cold or too shocking treatment. If a patient is kept continuously chilled, so that comfortable reaction does not take place between the baths, or the douche is applied so severely as to produce a state of unusual nervousness, the crises will be very apt to be injuriously violent. Hence the safer general plan of treatment, especially in home practice, is to take the slower yet surer way—do only what is clearly proper, and keep always on the safe side. In this way we only lose a little time, for which life or health should never be periled.

The diet has an important bearing on the severity of the crisis. In all cases, the more plain, simple, and strictly physiological is the food taken, the less severe and distressing will be the critical efforts; all gross, greasy, high-seasoned food, or complicated dishes render a severe treatment necessary to cure, and this necessarily involves a more violent crisis. It is a great error on the part of some physicians to allow a hotel table, and then depend on harsher water processes to effect the cure; the blame, however, is not all on the side of the physicians, for many patients prefer to "eat what their souls lust after," and take the harder treatment, greater suffering, and less perfect cure.

Doctor J. Weiss says (*Hand-Book of Hydropathy*): "This natural vital process is not to be regarded as morbid, for, with the existing disease, it has nothing in common. While a disease lasts, therefore, no crisis can ensue. The appearance of the crisis announces a return of the vessels in the diseased parts to their normal activity, the resumption of the proper functions assigned to them; or, in other words, the emancipation of the organism or its organs from disease. This is the sole signification of the crisis, according to experience and nature."

Doctor E. Johnson remarks: "That the system, by virtue of its own inherent energies, sometimes purges itself of morbid matters by a crisis; that is, by establishing some temporary outlet through which such morbid matters may and do escape, is perfectly certain. The Aleppo boil, small-pox, measles, and many other well-known diseases, prove this to demonstration, and beyond the possibility of question. In all these cases the crisis is clearly the means of cure. Without such or some similar crisis, the patient must die. Whether the water-treat-

ment has the power of urging nature to the establishment of such temporary outlets is another question, to which I can only reply, that I believe it has."

Doctor Gully remarks (*Water-Cure in Chronic Diseases*): "In the course of the efforts which nature makes, with the co-operation of the Water-Cure, it sometimes happens that the new distribution of blood which they bring about is so energetically affected as to cause morbid congestions of blood in other organs than the diseased viscera. In this manner congestion of the lower bowel takes place, and is exhibited in *diarrhea;* general congestion of the skin takes place, and is exhibited in *sweats* of various kinds; or partial but more intense congestions of the skin take place, and are exhibited in *eruptions* of various kinds, and in boils of various degrees. To these exhibitions of transferred irritation and circulation the name of *crisis* is given. * * * Critical action, then, as a result of the water-treatment, signifies that the viscera have been enabled to throw their irritation and blood upon some other organs, the lower bowels, or skin; and that this excess of blood, and this irritative action attempts relief by throwing out large fœcal secretion, or unusual cutaneous secretion. This is all that can be said of a crisis; it is an outward and visible sign of the exercise of a power on the part of the inward organs to save themselves by a transfer of mischief to parts less essential to life."

Doctor Shew observes (*Water-Cure Manual*): "A crisis may be said to be a visible effort on the part of nature or the natural powers of the system, to rid it of some morbid matter or matters in it, or expelling them at some of the natural outlets of the system, as the skin, bowels, and kidneys. These appearances occur in the form of boils, eruptions, sweatings, diarrhea, mucous and bloody discharges, high-colored urine, feverishness, and the like. * * * The true philosophy of these apparent aggravations of disease is probably this: As the living power, or that which we call nature, becomes invigorated, a greater antagonism against disease is set up; the disease then makes a more desperate effort to remain, and, in the commotion thus caused, there appears to be an increase of the same."

Doctor J. H. Rausse remarks (*Water-Cure in every Known Disease*): "The conditions of disease during the Water-Cure, and particularly during the critical periods are, throughout, different from every thing which has formerly been witnessed. It cannot be otherwise, because this cure stirs up, little by little, all latent and most deeply-hidden matters of disease, and eliminates them through boils, etc.; on the contrary, all former methods of cure suppress the commotion of the struggles of disease, and force the causes of disease inward. The es

sential distinction between water and medicine is, that the former drives the peccant matter out of the body; the latter, however, drives it into the body. For this reason the mediciner seldom *perceives* that the causes of diseases are material, the water-doctor, however, makes this sensual perception in every disease. Hence arise the various views of the corporality and spirituality of disease."

Essentially all the authors above quoted mean the same things, however fancifully or fantastically their ideas may be clothed in language. Remedial efforts are always going on in the organism when it is in any way morbidly affected; and when those efforts are disproportionately manifest at one or more points of the body, or through one or more of the depurating organs, this manifestation is called a crisis. Critical efforts attempt to perform a threefold duty: eliminate morbid matters, balance the circulation of blood, and equalize the distribution of nervous energy. This latter duty is too generally overlooked. Some authors write as though all the good effected by a crisis, a boil, for example, was the riddance of a specific quantity of morbid material; but this is a very narrow view of the subject: that is indeed one, but the least of the remedial effects accomplished. The amount of morbid matter deterged from an extraordinary boil in a week would not equal the ordinary daily elimination of morbid matter from the skin or kidneys. The greatest effect, therefore, is the restoration of more efficient vital action, the better radiation of vital power from the presiding centers of organic life.

All morbid actions are evidences of the remedial efforts of nature to overcome morbid conditions or expel morbid materials. All that any truly philosophical system of medication can do, or should attempt to do, is to place the organism under the best possible circumstances for the favorable operation of those efforts. We may thwart, embarrass, interrupt, or suppress them, as is usually the case with allopathic practice, or we may direct, modify, intensify, and accelerate them, as is the legitimate province of hydropathic practice. But we must confess to the parodoxical proposition, that *the symptoms of disease are the evidences of restorative effort;* the effort, however, may be unequal to the end in view, and hence the powers of nature are to be assisted by removing obstacles, diverting irritation, etc.

To place this subject in a stronger, and perhaps clearer light, let us imagine that before our eyes stands an invalid, laboring under a complication of common infirmities, having also "suffered many things of many physicians," and that by some clairvoyant or other kind of vision, we can see through him. What do we discover? The whole mass of blood is thick, dark, viscid, and loaded with bilious particles; the

liver is indurated and torpid, and secretes but little bile, and that little remains so long in the biliary passages that it becomes partially decomposed, and, to some extent, putrescent and acrid; and where it enters the duodenum, it corrodes its mucous surface; the stomach has been so long plied with luxurious living, that its vessels are red, inflamed, and its secretion of gastric juice almost entirely suspended; the colon or large bowel is clogged up with hardened fœcal matters, and the rectum or lower bowel is full of hemorrhoidal tumors; the mucous membrane of the throat and mouth is covered with an erythematic eruption, and the nerves of the tongue and palate are semi-paralytic; the skin is livid, rough, and eruptive, its capillary vessels over-distended with thick blood, and its pores clogged up with dead, effete matters; from the deficient external capillary circulation the internal vessels are overloaded and engorged; the heart labors, throbs, and flutters; the lungs are so oppressed they cannot expand freely, and the system is not sufficiently decarbonized; the kidneys are distended, swelled, and their secretion imperfect, high-colored, and full of sediment; and last, though not least, the brain is constantly pressed upon by the current of venous blood which is there dammed up, as it were, by the general obstructions, producing vertigo, headache, and a thousand indescribable morbid sensations, etc., etc.

Such is not an overdrawn picture of a large proportion of Water Cure invalids. Now, what happens under treatment? The first effect of the water processes is to relieve the more prominent, yet more external, and less important of the symptoms, as morbid heat, inflammatory action, pain, irritability, symptomatic fever, restlessness, sense of general oppression, etc.; this is usually accomplished within four weeks, and the patient feels a newness of life; his spirits become buoyant, his step more elastic, and he experiences a sort of general bodily exhilaration; but, like the marred and scarred sapling, which has been bent to the ground, and rises up again when the superincumbent pressure is removed, he has wounds and bruises to heal. During the treatment, changes have been going on in all the machinery of vitality; obstructions have been more or less cleared away; torpid muscles aroused to action; long-smothered sensibilities stirred up in half-palsied nerves; the excitability of the contractile tissues re-developed; universal commotion has pervaded the domain of organic life.

In this state of general perturbation, when some parts and organs are surcharged with blood, and others bloodless—some inflamed, and others torpid—some excessively irritable, and others almost paralytic—some preternaturally sensitive, and others almost devoid of sensation—some oppressed with heat, and others depressed by cold—with impure

secretions in many organs, and excrementitious matters choking up the capillary vessels more or less in the different structures, it may well be supposed that the *vis medicatrix naturæ* would present many phases of irregular and disorderly action; sometimes concentrating the whole remedial effort in one direction or to one outlet; sometimes dividing it between several parts, and sometimes making it, with more or less force, successively in various directions.

These efforts are attended with waste or expenditur of organic force, and sometimes this expenditure for a time exceeds the replenishment; hence "reaction," as it is called, fails, and the patient feels a temporary depression, in which condition he is very apt to imagine the treatment "does not agree with his constitution." Now it is that the faith and skill of the patient and physician are put to the severest test. If the patient now takes his feelings for his guide, and abandons all treatment, he may commit a fatal error for himself, and give the whole water-system a bad name; and if the physician perseveres in the use of very strong impressions or very cold treatment, this temporary depression may become permanent, or, at least, unnecessarily painful and protracted. All the patient requires is rest, soothing appliances, and encouragement. If he feels very weak, let him follow his feelings in the matter of exercise; walk, sit, or keep his bed precisely as he can best enjoy or endure himself. If he is feverish, chilly, or in pain, administer local fomentations, or the warm or hot bath. In brief, he needs an expectant, nursing management until the organic powers have thoroughly *rested* themselves, and in three, six, or ten days, more or less, full treatment may be resumed to advantage.

But where disease and disorganization have pervaded a large extent of the domain of life, these efforts, and these sinkings, these general or partial crises, these "ups and downs" may be many before health is re-established; and the physician who undertakes specifically to *provoke a crisis*, with the view of curing, as it were, at a single dash, commits a grave mistake. Crises, or any number of critical efforts or disturbances, are always to be desired, but never to be sought by violence.

It often happens that patients whose bodies are extensively diseased, yet not very much exhausted in muscular power, experience very great benefit at a Water-Cure during the first month, after which they suffer a slight aggravation of many of their difficulties, and thus remain several months apparently in *statu quo*, not realizing within themselves or manifesting externally, any decisive indications of restoration, an yet in a few months longer find themselves in good health. Such cases of which I have seer many, prove to us that the process of repara-

tion, in the domain of the organic economy, like that of growth and development, is slow, silent, gradual, and almost imperceptible, and that, although we may rid the system of obstructions, morbid deposits, and active disease by the diligent employment of the Water-Cure processes, the re-establishment of firm and vigorous health requires weeks months, or years, and is influenced favorably or adversely by every circumstance and habit of life.

CHAPTER IV.

OF THE PULSE.

NATURE OF THE PULSE.—All persons who undertake the general direction of hydropathic appliances, ought to be familiar with the character and indications of the arterial pulsation. There is no surer test of the degree of existing vitality, or of the balance of circulation, and no better guide for the administration of water-treatment; while its variations denote, with considerable accuracy, many pathological conditions of the different organs and systems of the vital domain. For these reasons, this chapter may properly form a connecting link between the theoretical and practical departments of this work.

The beating of the arteries, caused by the afflux of blood propelled through them by the contractions of the heart, is called the pulse. Its characters relate to the force, frequency, strength, and equality of the pulsations themselves, and of their intervals. The most convenient method of ascertaining the state of the pulse is by compressing the radial artery at the wrist, with the balls of the first and second fingers; the main force is to be applied by the finger which presses on the artery *above*, or toward the heart. Its *strength* is determined by the degree of compression it will bear before it will cease to be felt by the finger *farthest* from the heart.

VARIETIES OF PULSE.—Medical authors enumerate many kinds of pulse, which are both fanciful and ridiculous. All the distinctions which are of practical utility are the following:

The pulse is called *regular* when its beats are uniform in force, frequency, fullness, etc and *irregular* when it lacks uniformity in these respects.

A *normally strong* pulse resists moderate, yet yields readily to severe pressure.

A *preternaturally strong* pulse is almost incompressible. A strong pulse is never very frequent, rarely exceeding 80, and never, perhaps, 90.

A *hard* pulse offers nearly as great resistance at first as a strong pulse, but yields more easily and completely to strong pressure.

A *soft* pulse feels full and round to the finger, but yields steadily and readily to pressure.

A *full* pulse gives to the finger the sensation of repletion or fullness.

A *contracted* pulse is nearly the opposite of the full pulse, the pulsations being narrow, deep, and somewhat hard.

A *frequent* pulse has an unusual number of strokes in a given time. The natural frequency of the pulse at the various stages of life is subject to considerable diversity. The average may be stated as follows: In the embryo, 150; at birth, 130; one month, 120; one year, 112; two years, 105; three years, 100; seven years, 90; twelve years, 85; puberty, 80; adult age, 70; old age, 65.

A *slow* pulse makes less than the usual number of strokes in a given time.

A *quick* pulse is one which strikes sharply and suddenly, as it were, against the finger without reference to the number of pulsations; hence it may be quick and frequent, or quick and slow. A quick pulse is never very frequent, seldom over 90.

The pulse is said to be *tense* when the artery resembles a cord fixed at each extremity; when it feels still harder and smaller, it is called *wiry*.

A *deep* pulse is that which cannot be felt without difficulty nor without strong pressure.

A *tremulous* pulse is one wherein each pulsation oscillates.

A *weak* or *feeble* pulse beats lightly against the finger, ceasing entirely on very slight compression.

A *small* pulse unites the character of the weak or feeble with the contracted pulse.

A *sharp* pulse is a combination of the quick and frequent; the artery strikes the finger both abruptly and rapidly.

The *pulse* is called *critical* when it becomes free, open, soft, etc., after having been irregular or abnormal in these respects.

The *dicrotic* or *double* pulse is that in which the finger is struck twice at each contraction of the heart: once lightly and once more forcibly.

An *intermittent* pulse is that in which a beat is occasionally missed

as it were; the intermissions are usually quite irregular, as one in five, six, ten, or twenty.

There are many technical distinctions of pulse, which are either unimportant, or merely subdivisions of those already named, as, *ardent*, when the artery seems to raise itself to a point in order to strike the finger; *goat-leap*, an imperfect dilatation of the artery, being succeeded by a fuller and stronger one—the artery seems to leap, as it were; *convulsive*, unequally frequent, or unequally hard; *deficient*, a feeble beat, which seems every instant about to cease; *depressed*, a pulse both weak and contracted, or deep; *filiform*, resembling a thread, slightly vibrating; *flickering*, *i. e.*, deficient; *hectic*, the weak, feeble pulse observed in hectic fever; *intercussent*, one in which a superfluous pulsation seems to occur occasionally; *intricate*, unequally slow and imperfectly developed; *jarring*, jerking and sharp; *languid*, slow and feeble; *large*, an open and full beat; *long*, one which strikes the finger to a great extent in length; *low*, the pulsations scarcely perceptible; *resisting*, slightly tense or hard; *undulating*, the pulsations resembling the motion of waves; *unequal*, the pulsations being unlike, or returning at unequal intervals; *vermicular*, resembling the motions of a worm; *vibrating*, jarring, like the motions of a musical string; *oppressed*, small, contracted, and slow; *laboring*, the blood seeming to be but partially emptied at each pulsation, etc.

Indications of the Pulse.—The *preternaturally strong pulse* is characteristic of high fevers and active inflammations. It is the kind of pulse which is said to *bear* bleeding well; bleeding does not immediately nor sensibly prostrate the patient; but often relieves pain and lessens sensibility. When this pulse exists, no matter by what name the disease is called, the cold ablution or wet sheet may be freely employed and safely continued until the pulse is reduced to the natural standard.

The *hard pulse* indicates a less degree of inflammatory action, or a great degree of irritation, without great debility. It is found in many forms of acute and sub-acute inflammation, as gout, rheumatism, pneumonia; in that form of continued fever called synochus; in many cases of what is called bilious remittent fever, in the early stages of intermittent fever, during the hot stage of the paroxysm, and generally in the early stages of the exanthems—measles, small-pox, scarlatina, erysipelas, etc. Bleeding renders it softer for a few hours, but, unless the cause is removed by some other means, the hardness soon returns. Cold applications may be employed under the same restrictions as for the strong pulse.

The *soft pulse* is always found in the normal state of the circulation, and sometimes attends diseases which are not marked by active inflammation, nor much debility. Bleeding always sinks this to a weak, contracted pulse. In water-treatment mild applications are most beneficial.

The *full pulse* indicates a good degree of superficial capillary circulation. Bleeding always permanently depresses this kind of pulse, but cold applications are generally very well borne. It is generally found in apoplexy, the hot stage of fevers, the incipient stage of pulmonary consumption, etc.

The *contracted pulse* indicates capillary obstruction and intense engorgement. Epidemic cholera affords an extreme example of this kind of pulse. It often "rises" on bleeding, to sink more deeply soon after.

The *frequent pulse* indicates irritation or inflammation, and when *very frequent* great debility. Irritable temperaments manifest a more frequent pulse than the phlegmatic; and females have a more rapid pulsation than males. A frequent pulse may be strong up to about 90 per minute; but beyond that point debility is generally proportioned to the frequency. In complicated affections of the thoracic and abdominal viscera, the frequency of the pulse is an important indication of the locality of the principal morbid condition. Thus, in dyspeptic consumption—an affection which commences with a diseased liver and stomach, and ends with tubercles or ulcers in the lungs—the pulse will be moderately slow while the abdomen is the principal seat of disease; it will gradually increase in frequency, as the disease extends itself to and occupies the lungs; and be very frequent when the viscera of the chest have become the point most dangerously affected. Nothing is more common than for experienced physicians to make the most egregious mistakes in diagnosticating between diseases of the liver and lungs, or between dyspepsia and consumption; but the frequency of the pulse, aided by other symptoms, ought always to insure a correct diagnosis. The importance of this symptom is enhanced by the fact, that in most chronic diseases of the abdominal organs, the pulse is preternaturally slow; while in all idiopathic affections of the chest it is more or less preternaturally frequent. In those dyspeptic affections or disorders of the liver, attended with a dry, husky cough, a tenacious secretion of the throat, or a glutinous mucous expectoration from the lungs, there is always danger of confirmed consumption when the pulse begins to beat with considerable frequency, say from 80 to 100.

The *slow pulse* indicates torpor, inaction, especially in the functions

auxiliary to digestion. Compression of the brain, from contusion, or effusion, or engorgement, not unfrequently produces a very slow pulse. Dyspeptics and hypochondriacs often manifest an extremely slow pulse. In all of the above cases the pulse frequently sinks to 50, and occasionally to 40. A change in dietetic habits, if it be from highly-seasoned, stimulating, or animal foods, to plain, simple, vegetable dishes, is always accompanied with a reduction in the frequency of the pulse. The long and slender arteries of tall and slim individuals beat less frequently than the shorter, thicker vessels of an opposite organization.

The *quick pulse* is similar in its indications to the hard pulse; but usually denotes a greater degree of irritation or inflammation.

The *tense pulse* denotes excessive irritation with considerable debility. It is usually found in constitutions which possess great activity with little strength.

The *deep pulse* is merely owing to the situation of the artery, which runs deeper beneath the integument than usual.

The *tremulous pulse* indicates extreme nervous debility with violent irritation, or excessive internal congestion. Tea, snuff, alcoholic beverages, and cigars are among its common causes.

The *weak* or *feeble pulse* indicates debility merely.

The *small pulse* denotes debility with more or less local irritation.

The *sharp pulse* indicates more or less debility with great irritation.

The *critical pulse* denotes the subsidence of irritation; a more perfect equilibrium in the circulation, and a general improvement in the patient's condition.

The *double pulse* usually attends organic affections of the heart or large arteries; yet it is sometimes found in very nervous dyspeptics, especially those who have indulged freely in nervines and narcotics, as coffee and tobacco.

The *intermittent pulse* is extremely common with dyspeptics, nervous invalids, sedentary persons, and those who are subject to constipation, and also with old persons. It not unfrequently occasions great alarm, being erroneously supposed to indicate aneurism, heart disease, or some other formidable and fatal malady. It indicates thick, viscid blood, capillary obstruction, or nervous exhaustion. Overloading a weak stomach, almost always produces an intermittent pulse for a time as do night suppers, and going to bed soon after eating.

The sub-varieties of pulse indicate complications of the conditions which give rise to the more distinct varieties, and are attributable to constitutional peculiarities, personal habits, local irritations, and many other circumstances relative to the individual, the disease, and the treatment.

PART V.

PATHOLOGY AND THERAPEUTICS.

CHAPTER I.

OF FEVERS.

CLASSIFICATION OF FEVERS.—The nosological arrangements of fevers, as found in medical books, are all, in my judgment, unphilosophical and absurd. Without wasting any of my limited space in exposing their errors, I will at once propose a classification which shall, at least, make a nearer approximation to pathological propriety.

Nosological Arrangement of the Simple Fevers.

Comm. fevers.

1. *Ephemeral.*—One day Fever,
2. *Inflammatory.*—Synochus—General Inflammation,
3. *Typhoid.*
   - Yellow Fever,
   - Nervous Fever,
   - Putrid Fever.

   Ship Fever, Spotted Fever, Camp Fever, Jail Fever, Hospital Fever.
4. *Remittent.*
   - Nervous Remittent,
   - Putrid Remittent.

   Marsh Fever.
5. *Intermittent.*
   - Quotidian—Everyday Ague,
   - Tertian—Third day Ague,
   - Quartan—Fourth day Ague.
6. *Symptomatic.*
   - Hectic Fever,
   - Puerperal Fever,
   - Mesenteric Fever,
   - Milk Fever.
7. *Eruptive.*
   - Small-pox,
   - Chicken-pox,
   - Cow-pox,
   - Measles,
   - Scarlatina,
   - Erysipelas.
   - Miliaria,
   - Plague

From this arrangement I have excluded the "bilious fever" and the "synochus," or "mixed fever" of authors. A mild form of the putrid typhus, when accompanied with bile in the stomach, and a yellowish conjunctiva, is often called bilious fever; so, also, is either form of remittent. The "synochus" is said by some authors to be bilious in the beginning, and typhus in the end. This is simply absurd. Other authors denominate it inflammatory at the outset, tending to a typhoid termination. This is mistaking an aggravation of symptoms for a change of type. Bystanders are often astounded at the bedside of the patient by hearing the physician announce that the fever has changed type, from bilious or inflammatory, to typhus or typhoid. All this I regard as sheer nonsense. All that it can mean in plain English is, the patient is worse, or has approached the critical period or turn of the fever.

The "congestive fever," as it is generally called in our Southern and Western states, is merely a severe form of intermittent or remittent, attended with the symptoms of a disproportionate engorgement of the brain or lungs. Sometimes a malignant form of typhus is called congestive fever, and occasionally almost all forms of fever, accompanied with severe congestion of some important viscus, are designated by this unmeaning term. European authors have entitled similar cases "pernicious fevers," by way of distinction: a more uncouth and senseless appellation than congestive.

Doctor William Jenner, professor of pathology in University College (*Braithwaite's Retrospect, Part XXIII.*), has lately classified continued fevers into *typhoid*, *typhus*, *relapsing* and *fabricula*. This "relapsing fever," we are told, is known by a reproduction of most of the febrile symptoms in about a week after the patient has become convalescent. He is then, without any apparent exciting cause, without any error or indiscretion on his part reattacked with violent fever, which lasts several days, and then terminates in profuse perspiration. A more appropriate name for this febrile disturbance is *drug-fever*. It is perfectly clear to my mind that, after the patient's body has been saturated, as it were, with drugs, as in the ordinary treatment of a fever, the vital powers will endeavor to get rid of the drug-medicines as soon as they have recovered sufficient energy to make the effort; and this effort is what Dr. Jenner distinguishes as a distinct species of fever, which he calls "relapsing," and treats with another course of dragging.

This explanation is confirmed, if not demonstrated, by the fact that the patients whose fevers are treated hydropathically, *never* have a relapsing repetition of the fever, nor any thing like it.

General Character of Fever.—A fever is a simultaneous abnormal disturbance of most or all of the bodily functions, such disturbance being manifested in periodical paroxysms, more or less severe and prominent, of cold, hot, and sweating stages.

It commences with languor, lassitude, and general disquiet, followed by shivering, rigors, or chills, then succeeded by hot flashes over the surface, with aching sensations in various parts of the body, particularly about the small of the back. Finally a preternatural heat, redness, and turgescence pervades the whole body, accompanied with headache, furred tongue, frequent pulse, deficient secretions, and prostration of strength. Sooner or later the superficial heat and redness partially or totally subside, and the paroxysm is terminated with more or less general or local sweating. Either stage of the paroxysm may be disproportionately severe, and either may be so slight as to escape notice.

Causes of Fever.—It would be a profitless waste of words to enumerate specifically all the circumstances which are supposed to be among the predisposing and exciting causes of fever. In a general sense they may be summed up very briefly: local contagions or poisons, unhealthful food, impure water, vitiated air, personal uncleanliness, over-exertion, atmospheric vicissitudes, gluttony, intemperance, etc.

Medical books are full of amusing specimens of thoughtless statements on this prolific subject. Thus Hooper, in his "Physician's Vade-Mecum, with Improvements by Guy and Stewart," gives us the predisposing causes of inflammatory fever in the following words: 'Plethoric habit of body, with a *strong muscular system; a good and unimpaired constitution!*" If muscular strength and a good constitution predispose us to disease, it is certainly very dangerous to have good health! The same author gives us, as among the predisposing causes of yellow fever, "the male sex," and among those of miliary fever, 'the female sex!" It is of such stuff that many medical books are made. I only marvel that some transcendent genius has not recorded *human nature* as a predisposing cause of disease!

Theory of Fever.—Since medicine became a system—it never was a science—theories of fever have, more than any other subject, displayed the genius of the great masters of the profession. The very names of all the different ones that have been written, would fill a volume; yet, at this day, we have in our medical schools no generally-recognized theory. All is now as vague, indefinite, and unsatisfactory

as in "the dark ages;" and the existing opinions of living authors regarding the nature of fever, are speculations of the most chimerical character.

Still, the whole subject seems simple enough. The reason why an explanation has never been found is, I apprehend, because it has never been sought in the right direction. A man who should look to the moon all his lifetime in search of the "philosopher's stone," might not discover it though lying at his feet. Medical philosophers, instead of rationally tracing the effects of riotous living and abused hygienic agencies, have expended oceans of midnight oil and centuries of brain labor in trying to *think out* some specific, strange, hidden, occult, mysterious, extra-natural thing, substance, element, or cause, whose existence should, in some magical manner, account for all the phenomena of fever. Of course, all their toil has been in vain. It has been rather worse than labor lost, for the writings and teachings of medical books and medical schools are so tinctured and mystified with the vagaries of medical professors, that the student of medicine is morally certain to get his mind more or less befogged, and his judgment to some extent warped by their influence.

TYPE OF FEVER.—A man of strong, vigorous constitution, accustomed to an active out-door life, yet regardless of healthful habits, eating and drinking what comes in his way, as is the fashion of the world, is exposed to unusual cold, wet, heat, labor, or some similar vicissitude. In a day or two he has a fever. Its type will be *inflammatory*, because his vital energies are strong and his viscera powerful, and in him nature—the organic instinct of self-preservation—is successful in throwing the morbid action to the surface. If the disturbing causes are slight, it will be ephemeral in duration; if more severe, typhoid.

Another man, of feeble constitution and sedentary life, is similarly exposed and similarly attacked. His fever will be *typhus*. There is less ability to react successfully, and the internal commotion is proportionally greater. The surface is less turgid, but the viscera suffer more internally. The brain manifests delirium, the lungs engorgement, the liver congestion, the stomach and bowels torpor or relaxation, and some physicians will call it *congestive fever*.

If either of the above patients has been gross in his eating habits; if pork, ham, sausages, cheese, and fine, constipating, farinaceous food have constituted a large proportion of his diet, he will have a yellow tongue, bitter taste in the mouth, bile in the stomach, etc. Then his fever may be called *bilious*.

The man of impaired constitution and weak digestive powers, who

is attacked with typhoid fever, will have the *nervous* form, if his brain and nervous system have been particularly abused, overworked, or stimulated by tea, coffee, liquor, or tobacco, and the *putrid* form if his personal and dietetic habits are gross, and particularly constipating and obstructing.

The *yellow* variety is produced by causes which especially operate to impair the secretion of the liver, as excessive heat, animal or vegetable miasms, combined with gross diet and stimulating drinks. Every kind of animal food, except, perhaps, milk, in very warm climates, I regard as a predisposing cause of yellow fever.

The other forms of typhus, called *ship*, *spotted*, *jail*, *camp*, and *hospital* fevers, are nothing more nor less than the common or typhoid fever, modified by local causes and particular personal habits.

Remittent fever may be of the nervous or putrid tendency, for the reasons already assigned. Its remittent character is owing undoubtedly to a disproportionate affection of the liver and spleen, a condition of obstruction and engorgement produced by noxious effluvia, or any impurities from decaying vegetable and animal matter, to which the system has been for a long time exposed.

Intermittent fever is the result of the same causes operating more gradually, that is, in less force, and for a longer time. The periodicity of the paroxysms must be referred in part to organic laws and in part to constitutional peculiarities. This view of remittent and intermittent fevers is confirmed by the fact that enlargements and indications of the large glandular structures, the liver, spleen, and pancreas, are most frequent in those who have been the subjects of protracted agues.

Symptomatic fevers are merely states of constitutional irritation from local causes, generally chronic topical inflammation. Thus *hectic* fever is a general febrile disturbance from tubercles or ulceration of the lungs. *Puerperal* fever is a consequence of inflammation of some one or more of the abdominal or pelvic viscera or appendages, generally peritoneal inflammation after childbirth. *Mesenteric* fever arises from worms, indigestible food, etc. *Milk* fever is occasioned by an inflammatory state of the female breast.

Eruptive fevers are characterized by an accompanying rash, efflorescence, eruption, or pustular affection of the skin. They are generally contagious, and depend on a specific virus, which works through the blood like a ferment. The precise *modus operandi* by which this infectious element is first produced cannot be precisely explained; yet the principle or law of its generation and operation is sufficiently obvious. Vegetable ferment, called yeast, it is known is produced from decomposition of vegetable matter. This is in reality a rotting process

by which certain proximate principles are decomposed and so rearranged as to constitute an entirely new product. The new product, of course, holds an unphysiological scale of chemical affinities in relation to the constituents of the healthy fluids, and hence when brought into contact with those fluids, another set of chemical actions, decompositions, and recombinations takes place, by which some element is changed, modified, or destroyed.

We know, too, that when animal secretions or excretions are in a certain decomposing state, which is exactly analogous to vegetable fermentation, they will, by being brought into contact with the blood of a healthy person, produce more or less of a similar change or decomposition in its elements. Poisoning from dissection is a familiar illustration. Personal filthiness, combined with foul and unclean food, will develop an infectious matter and disease the structures, and by contact, communicate a similar morbid action to another in comparative health, as the horrible story of prostitution in cities can tell. We can then easily understand the law which develops infection of all kinds, if we cannot detect its chemical nature; and for all practical purposes, a knowledge of the law is sufficient.

All large collections of rotting or decaying vegetable and animal substances engender the poisonous ferment of contagious and other fevers; and if we look over the whole surface of the globe, we can easily find sources enough to account for all the infection, whose results are manifested in putrid, malignant, and contagious fevers, dysentery, cholera, etc. Thousands of human bodies, and the carcasses of beasts, lie rotting on the battle-fields of this blood-stained earth, from which currents of deadly virus are borne by the winds to infect the breath and blood of people at a distance of hundreds and thousands of miles; the graveyards and cesspools of all large cities are constantly sending forth streams of death in all directions; and hardly a country place can be found where there are not local sources of this deadly ferment in the shape of hog-pens, distilleries, slaughter-houses, etc. And when the infectious ferment is once produced, it has the power of propagating itself whenever it can find congenial elements in the fluids of our bodies, our only defense being vigorous functions and pure blood—good health.

Rationale of Fever.—The living organism is endowed with the inherent power of self-preservation. Each organ or part, to a certain extent, resists all morbific influences, and expels all morbific materials from the body through the various excretories. If the causes of disease—all of which may be summed up under the heads of impure or

obstructing materials, and exhausted nervous power—diminish the depurating power of the skin, the liver, bowels, kidneys, and lungs, increase their labors to keep the body pure. If the liver becomes clogged up, the lungs, skin, bowels, and kidneys undertake the office of the impaired organ. If the kidneys are impaired functionally, the skin, lungs, etc., have an augmented duty. But the causes of disease often operate and increase so gradually that all the excretory functions are impaired. Hence the effort to relieve the system must be general—universal commotion takes place. Some organs were originally stronger than others; some have been more injured than others by bad habits or previous diseases; hence the struggle will not be equally balanced. Though all the vital energies co-operate in the "effort of nature," they will act with irregular and unequal energy. The whole vital machinery is thrown into disorder. There is *a* fever. *The kind* of fever depends on the circumstances already adverted to.

But alternate action and repose is a general, universal law of the animal economy. After the organism has prepared itself for the remedial and expulsive effort (the cold stage), the vital instincts *(vis medicatrix naturæ)* direct their whole energies to the surface (the reactive or hot stage), as the best channel of purification. At length fatigue ensues, and repose must and will be had. The heat abates, the heart's action becomes milder, the turgescence subsides, and the collapse, or sweating stage, concludes the paroxysm.

If the morbific causes were slight in intensity, and the morbid material small in quantity, the single struggle may have sufficed to set the vital "house in order." Then the paroxysm will not be renewed. Otherwise it will be repeated again and again, until "victory or death" results.

If this view of fever is right, the drug-system of treatment must be wrong. Instead of "aiding and assisting nature," it tends to smother her efforts, and adds still other extraneous agents for the vital powers to contend against.

But it may be asked, by way of objection to the treatment I shall advocate: Why, then, if the paroxysm of fever is a remedial effort, do you disturb this effort with your cold, or tepid, or hot-water processes? Why cool the hot stage of a fever with cold bathing, and object to cooling it by cold bleeding and cold drugging? I answer: The organic instincts are true to nature; they are infallible in the matter of mere existence. But they are not intelligent; they are not reasoning entities. It the stomach is attacked with a poison, say a "blue pill" or a glass of grog, it will be true to itself, and yet be satisfied to pass the offending agents off to the liver or the skin. If the

bowels are attacked with a portion of epsom salts, or a dose of "No. 6," they will either pass it off rapidly, or, failing in that, pour out serum to defend themselves. If the circulating fluids are charged with animal oils, the capillary vessels will deposit it in the cellular tissues. All these particular functions act also for the general good; but while each and every function participates in a general way in the preservation of the whole domain of life, each organ has its own special law of self-preservation. Hence when all the organs are struggling to relieve themselves, disorder, and riot, and excess may result. And here right reason may come to the aid of instinct by supplying favorable conditions, as perverted judgment has brought the trouble about by forcing unnatural conditions upon the organism. By all those means which help those efforts of nature to maintain or obtain the circumstances which constitute the normal state, without calling out a further expenditure of vital power, nor adding still other morbific agents, nor chemically injuring the structures, we may truly practice "the healing art."

Crisis of Fever.—Since the days of Hippocrates, the opinion has prevailed that fevers naturally, if left to themselves, evince a tendency to run a certain course, and terminate in a given time by a sudden aggravation of the symptoms, called sinking, or a complete subsidence of them, and the commencement of convalescence. This change has been called the *crisis*, and the days on which it occurs, *critical days*. The 3, 5, 7, 9, 11, 14, 17, and 20, have been regarded as critical days Because of this tendency, many drug-authors are opposed to all attempts to break up the disease or shorten its course. Their plan is to conduct it through its course; but *how* do they propose to conduct it through its course? Why, by poisoning the body through and through, with course after course of drugs! There is nothing known to civilization more thoroughly barbarian than the drug-treatment of a fever.

The subject of crises in acute diseases is of no practical consequence whatever. Under water-treatment, the only crisis observable is the cure. Crises proper, under hydropathic management, are known only in chronic diseases, and in these neither crises nor cures are scarcely known in allopathic practice.

Duration of Fever.—The ordinary duration of inflammatory fever is from one to two weeks; the nervous form of typhus, from four to six, or even eight weeks; the putrid form from two to three weeks; remittent fever from two to four weeks, when treated according to the popular system. Intermitting fever is often "broken" in a few days,

but seldom cured, and generally reoccurs at uncertain intervals for months or years. Ephemeral fever is frequently converted, by one unfortunate dose, or a severe bleeding, into a protracted fever which runs several days or weeks. Under water-treatment it is very rare for any fevers, except the eruptive, to hold out over a week; and in eruptive diseases, whose febrile excitement usually continues from seven to eleven days, the violence of the disease is generally entirely subdued within one week. I have never yet personally known a fever run over a week under water-treatment, and I have treated all the common forms in New York city for the last seven or eight years—ephemeral, inflammatory, typhus, ship, scarlet, measles, small-pox, etc.

General Treatment of Fever.—The indications are: 1. To equalize the circulation. 2. To purify the body. Practically these distinctions may be more nice than wise; for all the means best calculated to fulfill one indication are also the best adapted to the other.

Bathing.—Nothing in the way of medication is more beautifully simple and promptly successful than the hydropathic management of a fever. The temperature of the body is the sure and invariable guide for the water processes. If the whole surface of the body is hot, cold water is to be applied by frequent ablutions, or the rubbing wet sheet, or the wet-sheet pack, and often repeated until the temperature is reduced to the natural standard. The pack is the most pleasant and most effectal process, and its soothing and tranquilizing effects upon the whole nervous system far exceed all the opiates in the world. If the temperature rises again, the processes are to be repeated in the same manner. If the feet are cold, they should be held in hot water a few minutes, or a bottle of hot water may be applied to them. Especial attention must be given to warming the feet in all cases where the head is oppressed and the lower extremities are inclined to be cold. In what are called *low* or *nervous* fevers, there is often great heat and irritation of the head, and great torpor, coldness, or numbness of the lower limbs. In these cases it is indispensable to balance the circulation by cold applications to the head and hot to the feet before resorting to the wet sheet. In *very low* fevers, and in all cases attended with extreme prostration and unequal temperature at the outset, frequently sponging the body with *tepid* water, is better than the wet-sheet pack, or very cold ablutions, for the reason that the shock of the latter tends still more to disturb the equilibrium of the circulation. Local pains, spasms, etc., are to be relieved by cold applications or warm fomentations, as either feels most grateful. As a general rule, cold compresses are most beneficial when there is constant heat, tender-

ness, and distention; and warm applications are indicated when the distress is periodic or spasmodic, or when unattended with heat, turgescence, or soreness. Severe headache may be generally relieved by cold wet cloths, and always readily subdued by pouring cold water over the temples and back part of the head for several minutes. This process will also generally relieve the severest retching, nausea, and vomiting.

I have never tried the process of immersion in treating fevers, but have every confidence that it would prove eminently efficacious in all *high* fevers—fevers attended with uniform and general heat of the surface, and a strong, hard pulse.

There is now living in a secluded town in Missouri an old farmer, who has practiced Water-Cure even longer than Priessnitz. A communication from him, addressed to the publishers of the Water-Cure Journal, will occupy two or three pages with as valuable matter as I could select from any source whatever; and, notwithstanding the author modestly desires to have some other name take the credit of giving his experience to the world, I shall take the liberty to record his name, and present his letter in his own farmer-like and unaffected simplicity of style and language:

"EAST PRAIRIE, MISSISSIPPI CO., MO., *Nov.* 30, 1850

"MESSRS. FOWLERS AND WELLS:

"I am a farmer, in my seventy-fifth year. I have taken your Journal since January last, and have taken Wilson & Co.'s little Dispatch for two or three years, and have always sent to him for any books he advertised on the subject of the Water-Cure, with the request that he would send me the best and plainest he could procure. I think I have seven or eight of them, but in none of your Journals, nor in them, do I see where fevers have been treated with the success that I have treated them with for more than thirty years, and I have never failed in a single case to make a perfect cure in a few minutes. Strange as this may seem, it is nevertheless a fact, and this is the reason why I trouble you with these lines. I have no interest in deceiving you or any other person; and as for having my name published in your Journal as a great Water-Cure doctor, I wish you not to publish this, but give it to some person of your acquaintance in whom you have confidence, who will give it a fair trial, or to several, and if it succeeds, as I know it will, publish the fact in any person's name you please except mine.

"I have treated all fevers, fever and ague, etc., alike. My plan is simply to bathe at the time the fever is the highest; if the fever has passed its highest point, and is going off, I let the patient alone until it

returns. I know nothing of wet sheets, bandages, etc.; but when the fever returns, or gets as high as I think it will go, I put the patient in a hogshead that I keep for bathing. I have him go entirely under water, head and all, for three or four times, keeping his head under each time as long as he can conveniently hold his breath; then let him dabble in it up to the chin until the heat is reduced to the natural temperature, and the patient feels comfortable; then let him come out and wipe dry with towels, put his clothes on, walk about, lie down, or do as his inclination leads; eat what he will, drink what he pleases; as for rubbing, I do nothing of the kind. I pay no attention to the temperature of the water, the object being to bring the patient to the natural heat, and this can be done in fifteen or twenty minutes.

"When I have no convenience for bathing, and, in fact, sometimes, as a matter of preference, I pour water on the patient's head, instead of bathing; and, surprising as it may seem, this always has the same effect that bathing has, and I do not know that it takes longer to cool the body in this way than it does by bathing. I have the patient lie with the head over the edge or side of the bed, so that the water will not wet the bedding. I then get a bucket of the coldest water, place it under the head, and pour the water over the back of the head from one temple to the other, the patient lying with the face downward. I pour it on moderately, and at the height of the fever; I think it will have little effect if done at any other time. Pouring water on the head in this way will cool the whole body nearly or quite as soon as going all under water, as before directed. If the water is not poured on long enough at first, the fever will return in a few minutes, but repeat the pouring then as at first. I have known the fever return twice before it was finally driven away.

"The next day after the treatment the patient is capable of attending to business as usual, and I do not recollect a case in which the patient had another attack the same season. There is one thing I cannot understand—how pouring water on the head should relieve the stomach of bile; but so it is; let the patient be ever so sick at the stomach, and incline to vomit ever so much, in two minutes after you begin to pour water on the head, the stomach is relieved, and there is no more of that trouble. As before stated, the cure is completed in a few minutes, and it is a permanent cure, and a cure that all persons can perform at home without any inconvenience. The shortest time I have seen noted in any of your books to cure the fever and ague is five days, and that with your wet sheet, etc.; I am sure this plan is a great deal easier, and much quicker; and again, these books give no directions when to commence the treatment, which I am certain is a mate-

rial point. I am sure if my mode is not employed as directed, at the height of the fever, it will fail. As stated in the beginning, I am no doctor, neither did I make this discovery myself. I lived forty-two years on the Sciota bottom-lands, in Sciota county, Ohio, the most noted place for bilious complaints perhaps in the world. A physician who had attended my family, being about to move away, I asked him whom I should apply to after he was gone, in case of sickness. He then told me how to apply water in all cases of fever I have now tried it more than thirty years, and have never failed.

"The effect the cold bath had on me last spring, in the worst dysentery I ever experienced, which I learned from Dr. Shew's Water-Cure for the cholera, no person would believe. I could name a great many cases of different kinds of bowel complaints, which have been successfully treated with Water-Cure; but it is a very smart undertaking for me to write a few lines, my hand is so unsteady, and I fear it will be a greater task still for you to read them. But I thought it was a duty I owed the community to make known my experience in the treatment of fevers with water, especially as there is considerable stir at this time about the Water-Cure. But I have found that almost ninety-nine in a hundred have been opposed to the application of cold water in any case whatever. The few who have tried the cure as directed, have never failed to get well speedily; yet, even they would almost always, on the next attack, apply to a drug-doctor. In the cases of small children, I have induced their mothers to hold them in a bucket or tub of water, and wet their heads continually for five minutes. I have never known this fail to cure the chills and fever; let it be done also when the fever is at the highest.

"I am respectfully yours, etc.,

"ABRAHAM MILLAR."

Since I have been in possession of the old farmer's experience, I have employed the pouring head bath more freely than ever before, and never without decided benefit. I deem it a valuable auxiliary to the wet sheet in all high fevers; in low fevers it cannot be as promptly successful, yet may be very serviceable; but care must be taken to keep the lower extremities warm, lest its application should produce reaction toward the brain. It will not, of course, cure protracted agues which are complicated with enlargement of the liver or spleen, but may in those cases very much shorten the duration of the disease if employed according to Mr. Millar's directions.

There is another very simple and very efficacious method of treating an ordinary fever, which has the advantage of always being convenient,

and may, for this reason, be preferred by those who do not well understand the management of the wet sheet, or who have not conveniences for the immersion or plunge-bath. Place the patient in a hip-bath—a common wash-tub—and two pails of water will answer; let the water be of a moderate temperature, 65° to 75°, and wash him all over the back and chest while in the tub; apply, also, several folds of linen to the head, wet in cold water, and changed very often until the head becomes cool, and if there is the least tendency to coldness of the feet—as there will be if there is great determination to the head—put them in a pail of warm water. The patient may remain in the bath five, ten, or fifteen minutes, if his strength permits. This process may be repeated as often as there is an exaggeration of the hot stage of the febrile paroxysm. When the patient is too weak to sit in the tub, the head and feet may be treated as just recommended, and the whole surface of the body frequently sponged with tepid water while the hot stage continues.

There are some cases of low nervous fevers wherein the heat is very unequally developed—the pulse very small and weak, the head oppressed or giddy, with great tendency to faint on slight exertion. In these cases reaction is so feeble that the full pack, so far from soothing the patient, increases the internal congestions, rigors, and local pains. Here the proper plan of treatment is to soak the feet occasionally in warm water, applying very cold compresses to the head at the same time; apply cold wet towels to the stomach, bowels, and back whenever there is continuous heat and tenderness about those parts, and sponge the whole surface of the body over with *tepid* water frequently whenever there is general and uniform heat and dryness. Continue this plan until the fever is gradually and finally abated.

Water-drinking.—Water should always be taken freely when there is thirst; and when the heat and dryness of the surface is great, and the tongue parched, it should be taken as copiously as the stomach will bear without unpleasant distention, even though there be no distinct sensation of thirst. In this case it should be taken frequently, but in small quantities at a time.

The Excretions.—When the bowels are not entirely free, they should be moved by one or more tepid injections. This may be done either before or after the cooling processes have been employed. Subsequently injections are only required whenever a sense of fullness, hardness, distention, etc., of the abdomen indicate an accumulation of fœcal matters, whether this condition occurs daily, or only once in two or three days. Indian or wheat-meal gruel promotes the action of the bowels, and for this purpose they may be taken to advantage when the consti

ation is considerable. Emetics are rarely necessary; I never prescribe them, except there is evidence of crude ingesta recently taken into the stomach. In this case the patient should drink warm water until vomiting occurs, or relief is obtained without. Copious warm water-drinking will often relieve nausea and distress from offensive acids, acrid bile, or irritating secretions in the stomach and duodenum, even though it does not produce sickness or vomiting.

Regimen.—Of the importance of free ventilation, perfect cleanliness about the room, frequent changing of the bedding, and the prompt removal of all offensive dejections or excretions, I hardly need speak. Common sense ought to be a sufficient guide in this respect. But there is general error committed by physicians and nurses, in the management of a fever, to which I wish to call especial attention. While all admit the free access of air, many are inclined to shut out the light. This error is more prevalent, according to my observation, in the country than in the city. The patient is often kept in a room so darkly shaded that there is an uncomfortable feeling of dampness or chilliness within, especially when the room is opposite the sun side of the house, or the house thickly surrounded with trees and shrubbery. The influence of light is not only vivifying to the patient, but it tends, also, to decompose and dissipate putrescent or infectious particles which gather in the sick room. There may be cases where the eyes are so excessively irritable and tender to light that it is necessary to shade them, but this should be done by a green vail or other eye-shade, while a good degree of light is admitted into the room. These remarks apply, of course, to natural or daylight, not artificial or lamp-light.

In relation to food and drink, the rule of practice is not difficult to memorize. The patient should drink at all times to the full satisfaction of the sensation of thirst; although, as just observed, when thirst is violent it should be taken frequently in small quantities. Crust-water, corn-coffee, lemonade, apple tea, etc., are no better than pure water in any case; but as patients often have a craving for them, and as they are both grateful and harmless, I would never object to them. Food should not be taken at all until the violence of the fever is materially abated, and then very small quantities of the simplest food only should be permitted, as gruel, with a little toasted bread or cracker, boiled rice, mealy potatoes, baked apples, etc. There is not a more mischievous or more irrational error abroad in relation to the treatment of fever than the almost universal practice of stuffing the patient continually with stimulating animal slops, under the name of "mild, nourishing diet," beef tea, mutton broth, chicken soup, panada, etc. The fever will always starve out before the patient is injured by absti-

nence, at least under hydropathic treatment, and the appetite will always return when the system is capable of assimilating food.

Local Complications.—Among the common incidents attending the progress of a fever treated in the ordinary drug way, are, excessive irritability of the stomach, vomiting, diarrhea, hemorrhage from the liver, bloated abdomen, or *tympanitis*, falling off of the hair, abscesses, boils, obstinate constipation, retention or suppression of urine, topical inflammations, dropsical swellings, etc. Most of these complications are factitious, and owe their existence entirely to drug medication, and are hence wholly unknown to the water-treatment. But as we are often called to patients who have been drugged, more or less, since the attack, we shall frequently have these incidents or accidents to manage. The stomach can generally be quieted by the free use of warm water, followed by bits of ice or sips of very cold water, and the cold compress externally. In a severe case apply also hot bottles to the feet and cold cloths to the head; and if the head be very hot pour cold water on it for several minutes, until it becomes perfectly cool. Diarrhea may be checked by the hot fomentation or warm hip-bath, followed by cool or cold injections. Hemorrhages require the cold compress, cool or cold injections, and bits of ice or frequent sips of very cold water, with the hot foot-bath. Tympanitis requires the same treatment, with occasional hot fomentations. Abscesses and boils need nothing but the wet compress. When the hair inclines to fall off, it should be cut very short, and the head often wet with cold water, but not covered. Constipation is to be treated with tepid injections, as copiously as the exigency of the case demands. Difficult urination can generally be obviated by the fomentation or hot sitz-bath, or these followed by the cold compress, or a dash of cold water upon the pelvic region. In extreme cases the catheter must be employed. Topical inflammations and dropsical swellings each require cold compresses frequently renewed.

Relapses.—I mention this subject only to contrast the condition of convalescent patients who have been through a course of allopathic drugging, with those who have had exclusive water-treatment. The former are always liable to relapses; the latter never.

Ephemeral Fever—Febris Ephemeris.—Some authors have distinguished this fever into three species, *acute*, *mild*, and *sweating;* but the distinction is of no practical utility.

Diagnosis.—Rigors slight stages of short duration, mental functions scarcely disturbed, terminating in a few hours in a moderate sweat.

The disease often disappears with a single paroxysm and seldom exceeds two or three.

Special Causes.—A slight cold, an indigestible meal, a debauch, over exertion.

Peculiarities of Treatment.—The wet-sheet pack for an hour, followed by the dripping-sheet, or cold ablution, or free injection, with fasting for twenty-four hours, will always remove this kind of fever.

Inflammatory Fever—Synochus.—The terms *synocha* and *synochus* are employed quite promiscuously in medical books. Generally, however, a distinction is made, the former term being applied to what is usually denominated inflammatory fever, and the latter to a form of fever which is regarded as a compound of inflammatory and typhus—inflammatory in the commencement and typhus in the end. The truth is, these forms of fever are but different degrees in the violence of the same essential type, which may be called *inflammatory* or *high fever*, in contradistinction to *typhus* or *low fever*.

Diagnosis.—This form of fever is rather peculiar to vigorous constitutions, and to persons of active, out-door habits of life. It may be distinguished from all others by the following assemblage of symptoms: Tongue generally white with red edges, pulse full, hard, *strong*, and quick, though never very frequent. Temperature of the body uniformly high after the fever is fully developed; eyes reddish; urine scanty and high colored; the whole surface preternaturally flushed and turgid; the mental functions but slightly disturbed, or not at all.

If this fever runs much beyond the ninth day, or if it is maltreated at the outset, the tongue becomes yellow, then brown, then black, and many symptoms of an original typhoid supervene. Like all continued fevers it is characterized by two exacerbations during the day; the first and mildest in the forenoon, and the second and severest toward evening.

Peculiarities of Treatment.—Of this fever it has been well said: "The blood is on fire; extinguish the flame, and the patient will be well." The hydropathic treatment is more simple and direct than in any other form of fever. Wrap the patient in double wet sheets, tightly covered with bedding; let him remain as long as he is comparatively comfortable; then wash him off with cold water. Repeat the process as often as the febrile heat increases. The immersion-bath and pouring head-bath, as practiced by Mr. Millar, are peculiarly adapted to this form of fever. In fact, a sufficient quantity of cold water applied in almost any manner, will finally effect a cure. Usually the bowels are constipated in the outset; hence free injections of tepid water are necessary.

YELLOW FEVER—TYPHUS ICTERODES—SYNOCHUS ICTERODES.—Yellow fever is generally regarded as peculiarly contagious, though, I think, quite erroneously. Some authors, among whom are Dr. Good, have placed it among the remittents, on account of the peculiar remission which occurs during its progress.

Characteristics.—Partial or general yellowness of the skin; paroxysms somewhat irregular; great tenderness or pain about the epigastrium, or pit of the stomach; type irregular, which irregularity consists in a marked remission of the febrile symptoms, occurring during the first day or two, usually about forty-eight hours after their access. In severe cases the eyes are intensely red; there is extreme pain in the eyeballs, back, and limbs. The *black vomit*, so alarming to friends and physicians, does not always take place, and when it does happen, I believe it is owing more to mal-medication than to all other causes combined.

Peculiarities of Treatment.—The excessive determination to the brain requires the constant application of the coldest wet cloths, or pounded ice, or the pouring head-bath. The stomach is usually extremely irritable, and requires the cold compress. When retching or nausea is distressing, warm water should be freely drank for a short time, followed by sips of cold water, or bits of ice. The feet should also be placed in hot water for five or ten minutes. The bowels are usually severely constipated, hence a succession of warm water injections should be promptly resorted to. The general treatment is the same as for inflammatory fever.

NERVOUS FEVER—TYPHUS MITIOR.—This has been called "mild typhus," "low typhus," and "slow fever." It usually runs from six to eight weeks under allopathic management. Some cases are attended with such prostration of the nervous system, that the patient either sinks or becomes convalescent in one or two weeks.

Diagnosis.—Great disturbance of the mental functions; dejection of mind; frequent, weak, irregular pulse; tongue covered with a white, thick mucus; eyes suffused; heat of the surface more or less unequal; frequent turns of muttering delirium; countenance peculiarly expressionless; the skin is liable to irregular dryness and sweats; the early symptoms are mild, and increase in violence gradually; the evacuations are not particularly offensive; the urine is commonly whey-like.

Peculiarities of Treatment.—In the nervous form of typhus, the indications are rather to equalize irregular temperature and action than to reduce excessive. In some cases the external heat is so high and

uniform, as to call for the wet-sheet pack; but more frequently the morbid heat is pent up, as it were, in the head and epigastric region, while the extremities are either of the normal temperature or cold. Under these circumstances, the *expectant* plan of treatment, as it has been called, is the best. Apply cold applications to the head, cold, wet towels, often changed, to the abdomen, and bathe the feet in warm water, or apply hot bottles to them; and whenever, under this management, the preternatural heat of the body becomes general, sponge the whole surface frequently with *tepid* water until the febrile heat subsides. Nausea, vomiting, and diarrhea are frequent incidents, and require the processes already frequently named for those symptoms.

Putrid Fever—Typhus Gravior.—This is a more violent and malignant form of typhus than the preceding. Jail, camp, ship, hospital, and several other fevers, usually considered as distinct species, are but modifications of the putrid form of typhus, as influenced by local circumstances, and require no special pathological or therapeutic notice. The *spotted* or *petechial* fever, so called from purple spots appearing on the skin before death, has prevailed extensively in many parts of New England and New York since 1806. It has been very fatal, and was formerly denominated *typhus syncopalis*, or sinking typhus. Medical books also make a useless and groundless distinction between typhus and typhoid fever, on the vague supposition that the atter has its seat more especially in a disease of the mesenteric and Peyer's glands. I reject this distinction as fanciful, if not puerile, and, as the reader will perceive, employ the terms typhus and typhoid indiscriminately.

Diagnosis.—Attack sudden; progress rapid; rigors severe; early and great prostration of strength; extreme anxiety and restlessness; the countenance is expressive of anguish and horror; pulse hard, but small and rapid; tongue dry and brown or black; the skin imparts more or less of a peculiar stinging, prickling, or burning sensation to the touch; the breath is hot and offensive; there is ringing in the ears; throbbing of the temples; intense headache; ferrety redness of the eyes; the excretions of urine and fœces are dark and offensive. In the advanced stage, spots or blotches appear on the skin from effused blood; forming petechiæ, maculæ, vibices, etc. There is great exhaustion of muscular power, and the face wears a livid instead of a florid flush.

Peculiarities of Treatment.—Perfect quiet, and abundance of fresh, unconfined air are indispensable. The bowels should be promptly moved by tepid injections, to be followed by enema of cool water, to

act as a tonic. In the early stages of a majority of cases of putrid fever, the morbid heat is sufficiently developed and uniform to demand the wet-sheet pack frequently repeated; but it is generally necessary to apply hot bottles to the feet and cold compresses to the head at the same time. When the heat is too irregular, and the circulation too low for the full wet sheet, the abdomen should be frequently wrapped in wet towels, and the whole body very frequently sponged over with *cool* or *cold* water. In other respects, the rules already given are sufficient to regulate the treatment.

Remittent Fever.—Remittent fever is distinguished from continued, by being attended with only one daily exacerbation of the febrile paroxysm, instead of two; there is also a greater remission of all the febrile symptoms at the end of the paroxysm, though this remission is not complete as it is in intermittent fever. The remittent type of fever is common to hot climates, but rare in the temperate. It is also especially prevalent in low, marshy districts, in the neighborhoods of stagnant waters, in the vicinity of lands occasionally inundated, and in localities where the atmosphere is loaded with the effluvia of decaying animal and vegetable matters. It is generally attended with great biliary disturbance, and in our southern and southwestern states it is often called "bilious remittent." Sometimes it is called "autumnal remittent," because it more generally prevails in the autumnal months.

The *nervous* and *putrid* forms of remittent are distinguished by the same symptoms which denote the same forms of typhus fever; a general disproportionate disturbance of the nervous system marking the former, and all the evidences of putrescency and extreme exhaustion manifesting the latter.

All the general and special directions for treating the different forms of continued fever will equally apply to the same forms of remittent. It should be remarked that many cases of remittent fever—and the same is true of typhus fever—do not, on their first access, exhibit distinctly either the nervous or putrid type, although they always conform more especially to one or the other as they progress. In all these cases, the character of the fever will approximate inflammatory synochus, or *high fever*, and should be managed accordingly.

Intermittent Fever—Ague and Fever.—Fever and ague seems to be especially connected with congestions in and functional derangements of the liver and spleen. Enlarged livers and spleens, called ague cakes are very common sequelæ of intermittents, although they are not unfrequently detected after protracted or repeated remit

tents. What are called "chill fever" and "dumb ague," are disguised or imperfectly-developed forms of intermittent. This disease is common to miasmatic localities and new countries, where decomposing vegetation abounds, and places where the dense foliage and stagnant waters fill the air with carbonaceous and hydrogenous gases, are much more subject to it than those which have been longer under cultivation. It is very prevalent in many parts of our Western States; and with the bad living which helps to produce it, and the huge doses of calomel, arsenic, and quinine given to cure it, a large proportion of those who "westward follow the star of empire," find their constitutions irretrievably ruined.

Diagnosis.—The intermittent type of fever is readily distinguished by the violence of the paroxysm, the regular succession of the cold, hot, and sweating stages, and the complete subsidence of all the febrile phenomena at the end of the sweating stage, this subsidence amounting to a periodical intermission of the disease.

Peculiarities of Treatment.—Intermittent fever exhibits a variety of forms, as—*quotidian ague*, having an intermission about every twenty-four hours; *tertian ague*, the intermission about forty-eight hours; *quartan ague*, intermission about seventy-two hours; to which some authors add sub-varieties, called *irregular* and *complicated*. These distinctions do not affect the question of treatment. The bowels should be well cleansed with tepid injections, and when there is much nausea, or bitter taste in the mouth, a warm water emetic is advisable. The wet sheet, or the immersion, must be resorted to during the hot stage, and the pouring head-bath when there is great determination to the brain, with severe headache. During the intermission, a hot bath, followed by the cold dripping-sheet, or cold shower, will generally soothe the nervous system, and mitigate the severity of the succeeding paroxysm. As the liver is always in a state of greater or less congestion, the abdominal bandage should be worn constantly.

We find this disease under such diverse circumstances, and with so various complications, that there is room for considerable skill in its management. Recent cases are effectually cured by a few packs, or a single immersion, except when the causes have been a long time accumulating. But frequently the liver or spleen is enlarged, or both may be in a state of congestion, and there is a dyspeptic condition attending it. Very often the skin is extremely torpid, and full of viscid, hardened, and impacted bile, the conjunctiva of a reddish-yellow, and, although sweating is easily produced, the real function of perspiration is scarcely performed at all. In these cases we may perhaps very soon "break the fits," but to effect a permanent cure, the functional

actions of the liver, spleen, and skin must be established. Until this is done, the *feverish* and *agueish* symptoms will exist in a more or less disguised form, or the disease will exhibit some other irregular form, and constitute a predisposition to glandular enlargements, dropsical accumulations, chronic and spasmodic rheumatism, etc. These cases require an active treatment for several weeks; and in some few cases, where the constitution has been shattered by repeated fevers in malarious districts, and more especially when the patient has been repeatedly cured by arsenic, quinine, calomel, etc., several months' time are required to effect a cure.

Regimen.—In continued and in remittent fevers, and in most other acute diseases, we have very little trouble about the diet, save keeping it away from the patient; nor much difficulty in this respect, for generally there is no morbid appetite in the way. But with intermittent fevers, which may be regarded as chronic diseases with acute paroxysms, the case is somewhat different. In those cases which linger several weeks, we must, of course, look to the nutritive function. Here we have not unfrequently to restrain the dyspeptic's craving for accustomed stimulants, the hypochondriac's rage for excessive quantity, and the epicure's goading desire for tit-bits and seasonings. We cannot turn the patient off "old-school" fashion, with, "Eat and drink what you find agrees best," and draw on the apothecary for the curatives, but it is our business to know exactly what will agree best, and so prescribe "according to knowledge."

The best diet is wheat-meal bread, cracked-wheat mush with a very *little* milk and sugar for seasoning, a very moderate quantity of the milder vegetables, and the free use of good, ripe, sweet apples, either baked or boiled. Grapes, tomatoes, prunes, and good dried fruits, are not objectionable. The crust of good sweet bread, and dry toast, or hard crackers, are excellent to improve the salivary and gastric secretions.

Water should be drank rather freely, on account of the tendency to waste the serum by perspiration. Exercise should always be moderate. Over-exertion during the intermission always aggravates the subsequent paroxysms. Sailing and carriage-riding are the most advantageous exercises.

Symptomatic Fevers.—These are treated on general principles as far as the constitutional disturbance is concerned, reference always being had to the primary affection. As they depend on a local pathological condition, they will be particularly considered under the heads of the idiopathic diseases, of which they constitute the symptoms.

SMALL-POX—VARIOLA.—The small-pox is a contagious eruptive fever, affecting both the skin and mucous membrane of the mouth, throat, stomach, and lungs. Its access is a fever; this is followed in three or four days by an eruption, which is *papular* at first, then *vesicular*, and lastly *pustular;* the pustules are *pointed* at first, but afterward become *umbilicated.* The eruption terminates in twelve to seventeen days in dessication and scabbing, leaving larger or smaller irregular cicatrices.

Species.—This disease appears in three forms: 1. Distinct small-pox—*variola discreta.* 2. Confluent small-pox—*variola confluens.* 3. Modified small-pox—*varioloid.* The *first* variety is the mildest; the eruption is regular, the vesicles distinct, and the fever of the inflammatory type. The *second* variety is the most severe; the vesicles are irregular and mixed, and mature imperfectly, and the accompanying fever is typhus. The *third* variety is the small-pox as modified by vaccination, or a previous attack.

Stages.—The phenomena of variola are divided into four stages: 1. *Incubation*, or the latent period; being the time that intervenes between the inception of the virus and the first appearance of the symptoms. This period varies from six to twenty days. 2. *Invasion*, which extends to the eruption, usually three or four days. 3. *Eruption*, the vesicating and pustulating period, extending to the eleventh or twelfth day 4. *Dessication*, extending to the time of cicatrization, usually about the seventeenth day. The time from the *third* to the *eighth* day, during which the papulæ change to pustules, is called the period of *maturation.*

Symptoms of Distinct Small-Pox.—The attack is characterized by the usual premonitory symptoms of a violent fever, as chills or rigors, lassitude, headache, pain and weakness in the back and loins, tenderness about the pit of the stomach, frequent nausea and vomiting, drowsiness, sometimes stupor, or coma, and with infants convulsions are frequent occurrences. These symptoms are succeeded by general heat of the body, dry skin, coated tongue, frequent pulse, and extreme restlessness, which continue until the eruption appears, when they partially subside.

The eruption appears first on the face and forehead, in the form of minute spots or papulæ, sensibly elevated above the surface of the skin. They are first noticeable about *forty-eight* hours after the occurrence of the rigors. During the *third* and *fourth* days the eruption extends to the sides of the nose, chin, upper lip, neck, and wrists, then to the trunk and thighs, finally covering the whole body. About the *fifth* day, little vesicles, depressed in the center, containing a colorless fluid,

appear, surrounded by an inflamed circular margin, one vesicle arising on the top of each little point or pimple. Usually the eruptive fever further abates, or entirely disappears at this time. There is generally, though not always, an increased flow of viscid saliva, some swelling of the throat, with hoarseness and difficulty of swallowing, about the *sixth* day.

On or about the *eighth* day, the pustules are completely formed and spherical, terminating in a point, and the vesicular fluid becomes purulent; the face and eyelids swell, and the mouth, nose, and fauces are covered with pustules. About the *tenth* or *eleventh* day from the access of the fever, or *eighth* or *ninth* from the appearance of the eruption, the inflammatory areola surrounding the vesicle subsides, the contents change to an opaque yellow, and a dark spot appears on each pustule. Usually at this time the tumefaction of the face subsides and the hands and feet begin to swell. After the *eleventh* day the pustules become rough, break, discharge their contents, which, by drying on the surface, form small crusts. In a short time these crusts fall off, leaving the part of a dark brown color, which often remains many days, and when the pustules have been very large, permanent indentations of the skin remain. About the *seventeenth* day, the *secondary fever*, which comes on about the completion of the pustulation disappears, and the swelling of the hands and feet subsides.

Symptoms of Confluent Small-Pox.—The eruptive fever is more intense, the strength is greatly prostrated, coma and delirium are frequent, and profuse diarrhea or salivation is often present. The eruption is preceded by an erysipelatous efflorescence upon the face, from which the pustules emerge on the second day, in the form of small red points, which run together, and form clusters, resembling measles. The pustules are irregularly shaped, and contain a dark, ichorous matter, instead of true pus. When the crusts begin to form, the whole face is covered with a general scab, which falls off from the fifteenth to the twentieth day. The fever does not cease upon the appearance of the eruption, but about the ninth day suffers a remarkable exacerbation; in very bad cases, the eruption becomes livid or black, and petechiæ, hemorrhages, bloody urine, and exhausting diarrheas occur. Should recovery take place, the pits or scars will be much deeper than in the preceding form. The patient frequently dies about the eleventh day.

Symptoms of Modified Small-Pox.—The eruptive fever, though generally severe, usually lasts but a single day. On the following day the eruption appears; first on the wrist and about the nose. Frequently a pimple on the *ala* of the nose gives an indication of the nature of

the malady. The course of the disease is shorter, and the symptoms more irregular than in the other forms. Some of the eruptions progress to perfect pustules; others die away without suppurating. As soon as the eruption appears, the patient is well, unless it is sufficiently extensive to keep up some degree of irritative fever.

Diagnosis.—The diseases with which small-pox is liable to be confounded, especially in its early stages, are—Chicken-pox—*varicella*, measles—*rubeola*; scarlet fever—*scarlatina*; and erysipelas. Variola may be distinguished from chicken-pox by the pimples appearing on the back, the maturation of the pustules on the third day, and the absence of suppuration and indentation, which characterize the latter disease; from measles, by the hoarseness, moaning, swelled eyelids and watery eyes, which attend the attack of measles, and the eruption appearing in crescentic clusters, not rising into visible pimples; from scarlet fever, by the strawberry appearance of the tongue, and the bright scarlet efflorescence of the skin, which usually appears on the second day in the latter disease; and from erysipelas, by the eruption or efflorescence being of a florid red color, and spreading from a particular point over a large surface, in the case of erysipelas.

Prognosis.—The result may be judged of by the condition of the body at the time of attack, and the intensity of the fever. It is generally favorable in the distinct and modified forms, and generally unfavorable in the confluent form. Dangerous symptoms are the pustules becoming flattened, livid, and interspersed with discolored spots, a sudden disappearance of the eruption, general pallor of the skin, with great anxiety and extreme prostration of strength, and complications with local affections.

Post-Mortem Appearances.—After death, dissection has shown the windpipe, bronchial vessels, lungs, liver, stomach, and intestines to be covered with pustules, with local inflammations in various organs; the whole body runs rapidly into putrefaction.

Causes.—Variola is produced by a specific contagion. Its nature has thus far eluded the recognition of our senses, and probably never will be detected by chemical analysis. The virus seems to act like a ferment in relation to some one or more of the elements of the blood, analogous to the process of saccharine fermentation. It is produced by subjecting the body to the effluvia arising from those who already labor under the disease, or by introducing a small quantity of the purulent matter of the disease into the system by inoculation. A doctrine has lately been started that the changes effected in the blood by the contagion of small-pox were a purifying process, analogous to the working of a barrel of beer. But the theory is refuted by the fact that all fer

mentation is a destructive process, absolutely decomposing the saccharine and other fermented matter, and resolving it into its ultimate elements.

Laws of Contagion.—It is communicated by contact, or through the atmosphere, by pustules, or substances imbued with the variolous matter, and equally by the living or dead body. It is occasionally epidemic. Sometimes, though rarely, it occurs twice in the same person.

Mortality.—From the statistics which have been collected, it appears that one in three or four cases are fatal. In the modified form, or in those who have been vaccinated, the mortality has been much less—about one in twenty. The periods of life of its greatest mortality have been under five and over thirty years of age; the ratio increasing below and above those ages, and being the least between them.

Sequelæ.—Medical books describe a long catalogue of diseases as the consequences of small-pox, some of which are more to be dreaded than the disease itself. Among these are *boils*, *abscesses*, *ulcers*, *gangrene* or *sloughing of the skin*, *erysipelas*, *suppuration of the joints*, *hip disease*, *ophthalmia*, *blindness from opacity of the cornea*, *inflammation of the serous membranes of the chest and abdomen*, *tuberculated lungs*, *consumption*, *mesenteric disease*, and *scrofula*. Some of these sequelæ doubtless result from frail organization, more from bad habits of living, and still more from unfortunate medical treatment.

Prevention.—Physicians are not at all agreed as to the propriety of resorting to vaccination as a protection from small-pox. The vaccine virus is the variolous matter modified by passing through the organism of the cow, or some other of the domestic animals; hence the disease resulting from its introduction to the human system is called *vaccinia* or *vacciola*, *cow-pox*, *kine-pox*, and *vaccine disease*. There is no question that it is, to a great extent, a protection from the violence and danger of the natural small-pox; at the same time there is danger of inoculating the patient with some loathsome and even worse disease, as venereal, or scrofula, from the impossibility of always getting a supply of vaccine matter from healthy constitutions. In either way there is a risk to incur, and it is a delicate matter for a physician to advise on a subject when both sides are hazardous. I am fully convinced that if people could bring up their children in strict physiological habits, the non-vaccinating plan would be altogether the best; but in a city this seems next to impossible, and in the country it is pretty generally neglected. Children reared healthfully in relation to food, exercise, and ventilation, have little to fear from any disease, however contagious, they may have this, but it will not endanger life, nor produce much deformity nor serious injury. I have seen, within the last year, a most horridly loathsome case of scrofulous disease, in which the patient

literally rotted alive at the age of fifteen, from unhealthy virus received when he was but three years of age. Parents often find some one of their children tainted with morbid humors, unlike any other member of the family, and which they are wholly unable to account for, except on the supposition of foul matter taken into the system by vaccination. My own practice would be to keep children as healthy as possible, and if the small-pox happen along, let it have its natural course. Those who have the means to do the same I would advise to act accordingly, while those who live, move, eat, and drink after the ordinary manner, would have a better chance at chances by resorting to vaccination.

Treatment.—As in all fevers, whether eruptive or not, the temperature of the body is the guiding principle in the treatment. To regulate the temperature and equalize the circulation, are the leading indications. On the access of the febrile symptoms, the bowels, unless entirely free, should be moved by tepid injections. When the fever is fully developed, if the heat is not great, tepid or cool ablutions to the whole body will moderate it sufficiently; if the fever is severe, and the heat extreme, the wet-sheet pack should be resorted to, and resumed as often as it becomes warm, until the skin becomes soft, and the temperature near the natural standard. Give the patient as much water to drink as the thirst demands. Give no food save Indian or wheat-meal gruel, and not that unless the appetite calls for it. Nursing children may take the breast as usual, if inclined. From the second to the fourth day, when the efforts of the organism are determined to the skin to produce the eruption, be cautious in meddling with the stomach and bowels. Thousands have been killed outright by an emetic or strong purgative administered at this critical period. At this time all the vital energies are aroused to throw the virus off through the surface, and if, by an irritating emetic or cathartic, this action be repressed, and the force or the disease directed to the stomach and bowels, death may be the speedy result. The principle here involved affords a satisfactory explanation of the superior *safety* of the homeopathic treatment, compared with allopathic, in all eruptive fevers, as has been frequently demonstrated in practice in the management of scarlet fever.

After the excessive febrile heat is subdued by ablutions or packings, two cool or tepid ablutions daily, morning and evening, will generally be sufficient through the whole course of the disease. Should the extremities at any time become cold, bottles of hot water should be applied. There is often a strong determination to the brain, evinced by headache, delirium, convulsions, etc., when cold wet cloths should be applied.

The secondary fever requires precisely the same medication as the primary, though if the former has been well managed, the latter gives but little trouble.

Ventilation is specially important; the patient should be kept in a large, well-aired room, of even and rather cool temperature.

Various expedients have been tried to mitigate the itching that often attends the dessication of the pustules, as well as to prevent pitting or scarring. None have, however, been found of much service. Washing the sores with cold cream is as harmless, and probably as useful, as any thing which has been suggested.

Note.—The symptoms of small-pox, in the above article, are stated as they occur in patients whose habits of life pattern after the usual fashions of society. The hydropathic practitioner will often find them very materially modified in persons who have for a considerable time been accustomed to a hydropathic regimen, especially in children who have been trained on the principle of "eating to live," instead of that of "living to eat." Indeed, in such cases many of the symptoms laid down in medical books as characteristic may be entirely wanting. I have a case at this writing under advisement, which strikingly exemplifies the difference between an eruptive fever occurring in a very healthy or a very unhealthy person.

Under judicious water-treatment, this frightful disease becomes divested of most of its terrors, and there is little danger, except in a person of extremely gross habits and foul blood, of the skin being permanently pitted or scarred.

Cow-Pox—Kine-Pox—Vaccinia—Vaccine Disease.—The vaccine matter is usually inserted under the cuticle, by three or four punctures, in one or both arms. On the *second* day small, red, hard spots appear, which increase sensibly on the *fourth*, and on the *fifth* become small pearly vesicles, soon after surrounded by a pink or crimson flush. On the *seventh* or *eighth* day the areola becomes circular or angular, and about an inch in diameter. The vesicle is uneven, with a central depression. On the *ninth* day the flush is increased, hard, and tumid, often attended with an erythema over the arm or whole body. About the *tenth* day there is a slight febrile paroxysm. On the *eleventh* or *twelfth* day the redness diminishes, the center of the vesicle is covered with a brown scab, which comes off about the twentieth day, leaving a deep, circular indentation, about an inch in diameter, with as many pits as there were cells in the vesicles.

The vaccine virus is usually selected from the fifth to the twelfth day

This disease requires no medication, save what is due to personal cleanliness, and "temperance in all things."

CHICKEN-POX—SWINE-POX—BASTARD-POX—VARICELLA.—This disease is characterized by slight feverishness, followed, within *twenty-four hours*, by an eruption of small, reddish pimples, appearing first on the back, very much resembling the first appearance of the eruption of small-pox. On the *second* day, the pimples become small vesicles filled with a colorless or yellowish fluid; soon after a thin scab forms at the top, without pus. About the *fifth* day the eruption disappears, without leaving any mark or cicatrix.

A daily wash of the whole surface of the body, with one or two wet-sheet packs, should there be at any time accidental feverishness, with a spare vegetable diet, is all the remedial attention it requires.

MEASLES—RUBEOLA—MORBILLI.—Nosologists divide this exanthem into two species, the *common* and the *malignant*—*rubeola vulgaris* and *rubeola maligna*. The first species is the mild form; the second is the violent.

Symptoms.—The early symptoms resemble catarrh, or influenza—cough, hoarseness, difficulty of breathing, frequent sneezing, itching of the face, smarting of the eyes and eyelids, nausea, thirst, etc. The eruption first appears on the *fourth* day, consisting of small red points on the face, thence extending downward over the body. These points do not rise into visible pimples, but are disposed in crescentric clusters, which feel a little prominent to the touch. On the *fifth* or *sixth* day the bright red color changes to a brownish hue, and in a day or two more disappears entirely with a mealy or furfuraceous desquamation of the cuticle.

The fever rather increases with the eruption, and is attended with pneumonic symptoms, as cough, soreness of the chest, and oppressed respiration. It usually abates considerably at about the end of the first week.

In the *malignant* form the eruption is earlier and more irregular, often receding and re-appearing, and of a dark or livid hue. The febrile symptoms are more severe, the abdomen is very tender, the head is delirious or comatose, the lungs are inflamed, and diarrhea and convulsions often occur.

Peculiarities of Treatment.—The mild form should be treated on precisely the same plan as simple inflammatory fever, and the malignant form should be managed exactly like typhus fever of the putrid

type. Nothing brings out the eruption so promptly and effectually as the wet-sheet pack, and at the same time moderates all the symptoms of violent disorder in the circulating and nervous sytems. When the eruption comes out full and free, and the fever is not violent, occasional tepid ablutions are sufficient. When there is much soreness of the throat, several folds of wet linen should be applied. Severe cough, pain in the chest, or inflammation of the lungs, requires the chest-wrapper, applied very wet, and well covered with dry flannel. Diarrhea, when present, should be treated with *cool* injections.

Sequelæ.—Under allopathic treatment, this disease exhibits an appalling catalogue of consequences, as—*Pneumonia, cynanche trachealis, bronchitis, consumption,* chronic *diarrhea, enlargement of the mesenteric glands, ophthalmia, abscesses in the ear, ulceration of the parotid glands, apthæ and gangrene of the mucous membrane of the mouth.* I apprehend that these sequelæ are to be attributed, in the main, to the drugging by which one poison is atttempted to be got out of the body by the introduction of a dozen others. It is certain that measles has been extensively treated in many different places in the Water-Cure way; and I have never yet known nor heard of a single death, nor of one of these resultant diseases.

Scarlet Fever—Scarlatina.—This exanthem appears in three distinct forms or species: 1. *Scarlatina simplex*—simple scarlet fever. 2. *Scarlatina anginosa.* 3. *Scarlatina maligna.*

Symptoms.—After the ordinary premonitory symptoms of general fever, a bright scarlet efflorescence appears, usually on the *second* day, first on the face, neck, and breast, extending downward over the trunk and limbs. At first the eruption consists of innumerable red points, between which the skin exhibits the natural color; these spots finally coalesce, so that in a few hours the red flush is universal. On pressure, the skin looks pale, but readily recovers its redness when the pressure is removed. In *one* or *two* days more the efflorescence again becomes partial, and is disposed in large, irregular patches, which do not disappear on pressure. The skin feels rough to the touch, and is occasionally studded with small miliary vesicles. About the *fifth* day the rash begins to decline, is indistinct on the *sixth*, and generally disappears wholly by the *eighth.* Desquamation of the cuticle commences about the end of the fifth day on the parts first affected, now extending over the body. On the trunk and limbs the cuticle comes off in the form of scurf, and from the hands and feet in large scales. At this time the mucous membranes are more or less affected. The eyelids, lips, edges of the tongue, nostrils, and palate exhibit a bright red color, the tonsils

are enlarged, and there is difficulty in swallowing. The fever disappears with the rash.

Such is scarlet fever in its mild form. The *anginose* variety is characterized by more severe general symptoms, dejection of mind, pain in the head, soreness and stiffness of the muscles of the neck. On the *second* day, hoarseness, difficulty of swallowing, hurried breathing, interrupted by frequent sighing, breath hot and burning to the lips heat of the surface very great, weak and frequent pulse, pungent, prickling pains. On the *third* day the face, neck, and breast appear redder than usual, or scarlet patches appear about the mouth and nose. The sub-maxillary glands are enlarged and painful, the palate, tonsils, and pharynx are reddened, specks and collections of thick mucus are observed about the mouth and throat. In a few hours, an intense redness prevails over the whole body, which is perfectly smooth to the touch. On the *fifth* or *sixth* day the deep scarlet is succeeded by a brown color, the skin becomes rough, and peels off in small scales.

The *malignant* form has been extensively known by the name of *putrid sore throat.* It is distinguished by intense inflammation of the throat at the outset, soon proceeding to deep ulceration and extensive sloughing. All the salivary glands are much enlarged, the eruption appears later in irregular patches, often disappearing suddenly. The general symptoms are all indications of the worst or putrid form of typhus fever.

Diagnosis.—Scarlet fever may be distinguished from *measles*, by the absence of cough, sneezing, and catarrhal symptoms; by the throat affection; by the peculiar strawberry appearance of the tongue, and by the greater extent and less defined form of the eruption.

Sequelæ.—The books give us about as terrible a list of diseases following on as the sequelæ of the scarlet fever, as they do in the case of measles. In the list are—*Anasarca*, or *general dropsy*, *enlargements of the joints*, *scrofulous affections*, *discharges from the ears*, *ulceration of the glands of the neck*, *ophthalmia*, *and inflammatory affections of the internal viscera.* But, as in the case of measles, I regard these consequences as owing much more to maltreatment than all other causes put together.

Peculiarities of Treatment.—The melancholy records of medical science afford on no page a stronger exemplification of

"The *deadly* virtues of the healing art,"

than on that wherein is written the management and fatality of scarlet fever. One, two, three, four, five, and even six members of a family are sometimes successively attacked and successively die—whether cut

down by the disease, or killed by the *remedies*, or hurried to the grave by their combined power. Some dozen years ago, I knew a regular physician to treat his three children—all he had—with the ordinary leeching, puking, purging, and antimonializing routine, and they all died; and I have not the least doubt he has treated all the cases he has had in the same way ever since, without even the suspicion that there was any possibility of a better way. About fifteen years since the disease prevailed epidemically among children in several places in western New York. I happened to be acquainted with two physicians residing in adjoining towns, whose practice was somewhat different. One bled freely, and gave liberal doses of purgative medicines. He lost about twenty patients; in several instances two, and in two instances three dying out of one family. The other bled only in a few of the milder cases, avoided all drastic purgatives, confining his treatment mostly to gentle laxatives, simple diaphoretics, and astringent gurgles. This physician lost but one case, although he treated a larger number than the former one. Both physicians had their particular friends and admirers, and I have no manner of doubt the doctor who lost twenty patients acquired just as much reputation as a skillful practitioner, and enjoyed just as much of the confidence of the people, as the doctor who lost but one patient; so blindly are people wedded to a routine in which they have been educated.

The *mild form* requires very little treatment. Occasional ablutions of tepid water, or the wet-sheet pack once or twice a day, if the fever is high, with a free injection of warm water to clear the bowels, if the abdomen is constipated, swelled, or painful, are sufficient.

Both the *anginose* and *malignant* forms require careful management. Employ the wet sheet, ablutions, or tepid sponging, according to the principles already stated. The feet generally incline to be cold, and particular care must be taken to have them warm and comfortable whenever the pack or any general bath is resorted to. Hot bottles or hot foot-baths answer this purpose. The throat is the most endangered part; in the *anginose* form, the swelling must be treated with the constant application of cold wet linen cloths, well but loosely covered. In the *malignant*, or *putrid* form, the coldest water, or pounded ice, should be frequently applied around the neck, and sips of iced-water or bits of ice occasionally taken into the mouth. On the access of the disease move the bowels moderately with warm water injections, aided by the drinking of warm water or gruel, if necessary. Whenever diarrhea attends, employ cold enema. Be careful and not disturb the stomach and bowels during the eruptive effort. If there is then great sickness or nausea, apply very cold compresses to the abdomen. Ex-

cessive restlessness, anxiety, delirium, or violent headache may be best relieved by a hot foot-bath, with a cold compress to the head, or, if the patient is able to sit up, a warm hip-bath.

There is often a considerable degree of blindness and deafness, as well as difficult respiration, attending the swelled throat; and physicians and friends will often, for these particular symptoms, insist on a little leeching, or a mild emetic, or a smart cathartic, or a barbarous blister. They are all bad, worse, or worst. There are states and stages in a severe case of scarlet fever, in which a single dose of an ordinary emetic or purgative, or a single bleeding, would be inevitably fatal; and it is to be regretted that so few physicians can or will understand this fact. In scarlet fever, as in all the exanthemata, there is a period when all the vital powers combine in a general effort to throw the morbid virus and febrile irritation upon the surface. It is at this precise time that the allopath regards the intensity of the fever as an indication for the lancet, or a relaxing emetic, or a depleting purgative. If he employs either of them at this critical moment, he either suppresses this effort, or produces a revulsion of the whole force of the disease to the internal mucous membrane, resulting, perhaps and probably, in inflammation, disorganization, and death.

Dr. Johnson, in relation to the diet for scarlet fever patients, says: "If there be appetite, farinaceous puddings should be given; if not, beef-tea, mutton-broth, gruel, barley-water, etc. Should the eruption come out languidly, and symptoms of great debility and oppression set in, no cold water should be allowed, but the mutton-broth, etc., should be given quite hot; and ten, fifteen, or twenty drops of aromatic spirit of ammonia, in water, twice a day; and hot tea should be administered while lying in the wet sheet." I protest against this whole plan of medication as being neither hydropathic nor rational. Nothing can be more preposterous than forcing food, especially stimulating animal slops, into the stomach, during a high fever, when the digestive powers are utterly prostrated. In lieu of the hot tea, hot broth, and hot spirit recommended by Dr. Johnson, the warm foot-bath, or hot fomentations to the abdomen, will, in the case supposed, supersede all necessity of employing these slop-drug preparations, as has been abundantly proved in the thousands of cases of this fever which have been successfully treated by American hydropaths, without, as far as I have heard, losing a single case when *no* drugs or animal slops were employed.

ERYSIPELAS—ST. ANTHONY'S FIRE.—This affection has been divided into *idiopathic erysipelas*, produced by the general causes of fever, and *traumatic erysipelas*, resulting from wounds and injuries. The

latter species frequently follows surgical operations performed on persons whose systems are gross, and whose blood and secretions are very impure. For therapeutic purposes these distinctions are unimportant.

Symptoms.—After the usual febrile chills, nausea, vomiting, etc., the patient is affected with great confusion of the head, amounting often to delirium or coma; the tongue is *moist*, and *uniformly white;* the pulse full, frequent, and compressible. About the *second* or *third* day, some portion of the skin exhibits a florid red color, from which the efflorescence spreads gradually, being bounded by a distinct margin, slightly elevated. The efflorescence extends until it occupies a large surface, attended with considerable swelling, and a peculiar acrid heat of the inflamed parts. When the face is the part principally affected by the efflorescence, the eyes are often closed by the swelled eyelids, and the whole hairy scalp is more or less inflamed. The efflorescence terminates in a few days, the time varying considerably, in the formation of vesicles, or in desquamation of the cuticle. The fever has the usual daily exacerbations of the continued type, but rarely manifests any marked remission until the eruption ceases to spread, from which time, in favorable cases, convalescence commences.

Special Causes.—No two diseases are more intimately connected with bad dietetic habits than erysipelas and scarlet fever. Both are very prevalent where swine-food, greasy sweet-cakes, and concentrated preparations of food are plentiful. Sudden changes of temperature operating on a system inflamed by gross or obstructed by constipating aliment, seem to be the principal circumstances on which these forms of eruptive fever depend.

Occasional Terminations.—This disease, medical books tell us, often terminates in a dropsical swelling—*erysipelas œdematodes;* deep-seated ulceration of the cellular membrane—*erysipelas gangrænosum*, *metastases* to internal organs; and sometimes it suddenly disappears in one part, and attacks a distant one—*erysipelas erraticum*. These sequelæ, however, like those of all the other exanthemata, are, to a much greater extent, attributable to injudicious treatment, or drug-treatment, than to all other causes combined.

Peculiarities of Treatment.—As in the case of all the other eruptive fevers, the general fever and the local inflammation may exhibit all degrees of violence and malignancy, from the mildest form of synochus, or inflammatory fever, to the most virulent character of typhus; hence the circumstances already noticed in relation to those fevers must be regarded in the treatment of this. Generally, the head requires the very free application of the coldest wet cloths, or the pouring head bath; and very frequently the feet are cool or cold, and require the

warm bath. In the early stages of most cases, two or three wet-sheet packs a day are desirable; but when the fever is strongly typhoid, the pulse weak, the circulation low, and the heat irregular, it is better to sponge the whole surface frequently with tepid water. Tepid injections should be employed freely on the access of the disease, but not resorted to during the eruptive stage, on the second or third day, unless there is manifest fullness and distension, indicative of fœcal accumulations in the bowels.

Dr. Johnson advises, in this disease, the wet sheet occasionally, and a nitrate of silver wash, or a coating of flour to the skin, a dose of castor oil, and then quinine and sulphuric acid once in six hours. Such treatment is sufficiently absurd, coming, as it does, from the author of a book on "Domestic Hydropathy;" but the absurd becomes the ridiculous when we come to Dr. Johnson's dietary part of the treatment, viz.: Strong beef-broth, thickened with pearl barley; yolk of eggs beaten up with milk, and a little wine and nutmeg added; sago, with a little wine in it; cold beef-tea, or cold mutton-broth, as common drink."

The only way to reconcile Dr. Johnson's *extreme* allopathic treatment of *this* fever, with his extravagant encomiums of the superior efficacy of water-treatment in *all* fevers, in a preceding work, is by supposing he never had any experience in treating erysipelas with water; and hence, as something must be prescribed, he naturally falls back on druggery. His reasons for introducing the drug-treatment here are completely self-stultifying. He says: "The weight of experience is in favor of quinine, and I should not consider myself justifiable in rejecting its aid, merely to gratify the pride of an exclusive practice. * * * Human life is too precious a thing to be trifled with merely to satisfy an impertinent whim, or foolish enthusiasm."

Now, if the principle implied in the above quotation is correct—if it be true that drug-treatment will save life in a fever where water-treatment would sacrifice it, the whole hydropathic system is one grand mistake, and its practice mere charlatanry. But if the exact contrary be the truth, as I hold, then Dr. Johnson's druggery, in scarlet fever and erysipelas, is considerably worse than scientific nonsense. American water-doctors find the new system as all-sufficient in these as in all other forms of fever. None of them, however, to my knowledge, have ever administered the execrable slop-grog food, of eggs, wine, nutmeg, mutton-water, etc. I would rather trust the patient with no medication whatever, than with the best water or drug-treatment, in connection with such a regimen as Dr. Johnson recommends.

MILIARY FEVER—MILIARIA.—This disease takes its name from the

resemblance of its vesicles to the grains of millet. Some authors group a variety of similar rash-exanthems under the general term of miliaria An eruption similar to that of miliary fever often appears in the course of other acute diseases, when the patients have been kept in hot, unventilated apartments, or dosed excessively with hot stimulating drinks. Lying-in women are peculiarly liable to this miliary eruption, under the usual erroneous management of their medical advisers. This fever occurs most frequently in those females who use tea excessively; it often attacks children who have been accustomed to hot drinks and aliments; and old persons whose blood is inflamed, and whose nerves are exhausted by acrid stimulants and narcotics—as cider, tobacco, etc.—are quite liable to it.

Symptoms.—With the ordinary accessory symptoms of fever, there is laborious breathing, frequent sighing, great debility, depression of spirits, restlessness, wandering pains, followed sooner or later by a profuse sweat, of a sour, rank odor, accompanied with a troublesome itching or pricking of the skin. The sweat may appear in *two*, *three*, *four*, *five*, or *six* days. At length, at an uncertain period, an eruption appears on the neck and breast of small red papulæ, about the size of millet-seeds, these gradually extend downward, over the trunk and extremities. The pimples do not become prominent to the eye, yet feel elevated to the touch. Often their redness disappears, leaving them of the color of the skin. After *ten* or *twelve* hours, a small vesicle appears upon the top of each papula, at first of a whey color, usually turning gradually white. Sometimes the vesicles remain red, and sometimes red and white vesicles are intermixed, but always have a strong, rank, offensive smell. In *two* or *three* days more the vesicles break, and are succeeded by small crusts, which soon fall off in scales. The febrile symptoms do not subside when the eruption appears, but after a variable interval.

Diagnosis.—Miliary fever is easily distinguished from all others by the profuse sweating attended with the fetid odor, and this being followed by the peculiar eruption.

Peculiarities of Treatment.—As miliary fever is attended with unusual debility in its early stages, cool or tepid applications are preferable to very cold. Hot or cold local applications, according to the rules often heretofore adverted to, with frequent sponging of the whole surface, according to the degree of general heat, are usually all the bathing appliances required. Unless there is diarrhea, the bowels should be freely moved by tepid injections at the outset. Local pains should be promptly treated with the cooling or warming wet compress, as either feels most agreeable to the patient When this fever has

been produced by the suppression of any customary discharge, warm hip and warm foot-baths are serviceable.

Note.—Some authors treat of "*gastric*," "*mucous*," and "*catarrhal*" fevers. These are merely complications of some of the forms of fever already described, with prominent symptoms of indigestion, or an increased and excessive secretion of a slimy or mucous matter, from acrid bile or some other irritant, or the usual evidences of what is called a "cold in the head." Sometimes these local irritations are attended with such a degree of constitutional febrile disturbance as to receive the above appellations.

PLAGUE—TYPHUS PESTIS.—The plague was first known in English history in 430, and lastly in 1679. In 302 it raged over Syria. In 540, and for half a century afterward, it prevailed extensively over Europe and Asia. Since 1645, when it last visited Edinburgh, it has repeatedly ravaged all the continent of Europe. Marseilles was ravaged by it in 1720, and in the course of the seventeen preceding centuries, it experienced twenty-seven visitations. It prevailed at Moscow in 1771 and 1772; at Noja, in 1815 and 1816; in the lazaretto of Venice in 1818; at Malta, in 1813; and at Gressemberg, in Silesia, in 1819. Lately it has been confined to the northern parts of Africa, where it is reputed to have originated.

The history of the plague, like that of the cholera, is a tremendous lesson, whose true moral is hygiene, unfortunately, however, but little understood, and still less heeded. Wherever and whenever it has raged, the place and the people were buried, as it were, in their own filthiness, and rioting in the grossest sensuality. The narrow streets, dirty houses, unventilated apartments, and gross food of the inhabitants, with drunkenness and debauchery, have ever been the *inviting* causes of this pestilence in all the cities of the Old World where it has ravaged and desolated. Athens, Rome, London, which were formerly more than at present, the world's great centers of luxury and licentiousness, have been repeatedly scourged with this prince of pestilences. Since the habits of the civilized world have become more cleanly, yet more debilitating, we have internal dyspepsias instead of external carbuncles, and the cholera instead of the plague.

The character of the plague is that of a malignant exanthem; a typhus fever of the putrid form, attended with carbuncular and imperfectly suppurating tumors, sometimes running into deep gangrenous ulcers, the patient often feeling as if burning up with internal fire. The treatment, on hydropathic principles, should be the same as for the putrid form of typhus fever.

CHAPTER II.

VISCERAL INFLAMMATION.

In this chapter, I purpose to treat only of *acute* inflammatory affections of the viscera. They are all characterized by a fixed pain or soreness, and sense of heat in the organ diseased, with a change in its secretory or functional action, and attended by a constitutional febrile disturbance. The accompanying fever may be either of the inflammatory or typhoid type. A visceral inflammation may be defined a general fever with a disproportionate local affection. This class of diseases is almost universally treated by allopathic physicians on the *antiphlogistic* plan—bleeding, salts, antimony, and a *reducing* regimen.

The group of diseases naturally associated under this head comprises the following species:

1.	Inflammation of the	Brain	Phrenitis.
2.	"	Pharynx	Quinsy.
3.	"	Larynx	Laryngitis.
4.	"	Trachea	Croup.
5.	"	Parotid gland	Mumps.
6.	"	Lungs	Pneumonia.
7.	"	Heart	Carditis.
8.	"	Stomach	Gastritis.
9.	"	Bowels	Enteritis.
10	"	Peritoneum	Peritonitis.
11	"	Liver	Hepatitis.
12.	"	Spleen	Splenitis.
13.	"	Kidneys	Nephritis.
14.	"	Bladder	Cystitis.
15.	"	Uterus	Hysteritis.
16.	"	Testes	Orchitis.

It is true that *otitis* (acute inflammation of the ear), *ophthalmitis* (acute inflammation of the eye), and *dysentery* (an acute inflammation of the mucous membrane of the bowels), belong pathologically to this group; but each possesses so many peculiarities, that system may be advantageously sacrificed to convenience; hence they will be treated of in subsequent chapters.

Theory of Inflammation.—Next to fever the subject of inflam-

mation has occupied the attention and exercised the ingenuity of medical scholars. But still we have no satisfactory explanation of the proximate cause of its various phenomena. Two theories are, at the present time, about equally prevalent in medical schools, one of which is, singularly enough, the exact opposite of the other. But, stranger still, some of our popular medical authors who are diametrically opposed to each other in theory agree exactly in practice; while others who agree exactly in theory are diametrically opposed in practice. These facts alone are sufficient to prove the whole pretended science of the popular system a mere hypothesis, and the whole drug-practice a mere experiment.

To illustrate: one theory of inflammation is, that it consists essentially in an *increased action* of the capillary vessels of that part which is the seat of it; and the other is, that it consists in a *diminished action* of the same vessels. Now, it would seem that these theories are distinctive enough to authorize opposite plans of treatment. But it does not so happen. Medical reasoning is a process *sui generis*. The most contradictory conclusions are often drawn from the same premises, and the same conclusion is often deduced from the most opposite premises. All medical books extant of the allopathic school "agree to disagree" in this. They all recommend *both* stimulating and reducing treatment for all forms of inflammation, whichever theory they adopt. If a person has inflammation of the head, lungs, liver, joints, etc., with a full, *strong*, hard pulse, they say, "*bleed*, because it reduces the strength of the system, and abates the force of arterial action." If another has inflammation of the same parts, with a *weak*, frequent, oppressed pulse, they still say, "*bleed*, because it *strengthens* the vessels by taking off a part of the load they have to carry." So, whether the action is high or low, strong or weak, bleeding is the remedy. The theory and the practice have really nothing to do with each other on the depleting plan. Nor is there a better connection between theory and practice on the stimulating plan. In many forms of gout and rheumatism, in dysenteric inflammation, in burns and scalds, etc., stimulants are recommended by many authors, as cayenne, opium, oil turpentine, camphor, brandy, nitrate of silver, spirits of nitre, mustard, etc. Why? "Because," say the theorists on the side of increased action, "the action of the capillaries has been preternaturally augmented, and we must let the action down gradually, by applying stimulants of a less intensity than the proximate causes of the diseased action;" and on the other hand, the theorists on the side of decreased action say "give stimulants, because the action of the capillaries has been preternaturally diminished, and thus excite them to greater ac-

tion." Such is the confusion in which the whole subject of inflammation is involved—a confusion which, to my mind, is conclusive that both theories, and all the practices predicated upon them, are radically erroneous.

Rationale of Inflammation.—Experiments have amply demonstrated the fact, that the vessels in an inflamed part are distended with blood beyond their normal condition, and that the blood in them moves slower than in health. As far, then, as increased or diminished action is concerned, the latter theory seems plausible; and all the conflicting methods of medication appear to aim at producing, directly or indirectly, one single effect, viz., contraction of the coats of the over-distended vessels. For this purpose the most opposite agents and processes are resorted to; the blood taken out, or brandy administered, hot fomentations employed or ice applied, refrigerating nitre or scorching capsicum exhibited.

There is, undoubtedly, in the early stage of inflammation, an increased contractile effort of the capillaries, but accumulation and engorgement with relaxation soon become their permanent condition. This temporarily increased action cannot, therefore, be regarded as the proximate cause of inflammation, but as the effort of nature to overcome its cause or counteract the effects.

Inflammation, as well as fever, is the effort of the vital powers to protect the organism from injurious mechanical, chemical, or vital irritants, or to expel morbific materials. This is proved by the phenomena of a multitude of morbid conditions. When a part of the body becomes gangrenous or dead, the living parts, provided there is sufficient vitality remaining in them, immediately form a line of demarkation, and the dead portion is soon separated from the living; this process is called *sloughing*. When a chemical or mechanical body is imbedded in the flesh too firmly to be removed by absorption, as a bullet or a splinter, purulent matter is formed around it, and its further action on the parts is partially or wholly prevented by inclosing it in an abscess. When a grain of calomel gets into the lacteal vessels, the mesenteric glands, which may be regarded as organic inspection offices. receive an increased determination of blood, swell up, or inflame, and thus retard the contraband article, until it can be more or less modified or destroyed by the vital powers. When a structure is divided, as by an incised wound, coagulable lymph is poured into the wound, forming, as it were, a bed for the newly-formed vessels to re-unite the part —a process called *adhesive inflammation*. And when a portion of the flesh is torn away by violence, or decomposed by corrosives, or burned

out with fire, a covering of purulent matter is thrown over the exposed surface, beneath which granulations—a new growth of substance—gradually fill up the cavity; this process is called in medical books *healthful* or *restorative inflammation.*

VARIETIES OF INFLAMMATION.—Various circumstances conspire to modify inflammatory affections so much as to allow of their division into several well-marked and distinctive kinds. Peculiarity of constitution, the structure of the part or organ, the nature and violence of the predisposing and exciting causes, are the most prominent of these circumstances. Inflammation tending to suppuration in a defined limit, as in the case of boils, abscesses, etc., is called *phlegmonous.* That form which is attended with eruptions, efflorescences, rashes, extensive ulcerations, rapidly-spreading gangrene, etc., is called *erysipelatous*, or erythematous. When it tends to the formation of a preternatural membrane over the mucous surface, as in croup, tubular diarrhea, catarrh of the bladder, catarrh of the uterus, etc., it is called *membranous*, or *membranific.* When it affects mainly the glandular structures and mucous or serous membranes, without febrile symptoms in the early stages, as in tubercular consumption, internal dropsy of the head, and swellings of the conglobate glands, it is called *strumous*, or *scrofulous.* When confined mostly to the structures of the joints, as in gout and rheumatism, it is called *arthritic.*

Inflammation is also divided into *acute*, *subacute*, and *chronic.* The first is attended with general fever; the second is accompanied with occasional febrile paroxysms; the last is without constitutional febrile disturbance.

TERMINATIONS OF INFLAMMATION.—All inflammatory affections terminate either in *resolution*—a gradual subsidence of all the symptoms; or in *gangrene*—the death of the inflamed part. But there are many results or consequences of inflammation which are usually called terminations by medical authors. These are *exudation* or *effusion*, *suppuration*, *ulceration*, *induration*, and *adhesion.*

GENERAL TREATMENT OF INFLAMMATION.—The hydropathic management of a visceral or local inflammation is precisely the same as that of a general fever, with the addition of the local appliances. The heat, pain, swelling, and all incidental accompaniments, are to be treated exactly as we would treat the same symptoms when present as complications of a simple fever The regimen is also, in all respects, the same as for simple fevers.

Inflammation of the Brain—Phrenitis—Brain Fever.—This disease is also sometimes called *phrensy*. Some authors distinguish it into two forms—*encephalites*, when it affects principally the substance of the brain; and *meningitis*, when it affects principally its investing membranes; but as the disease, whichever structure is primarily affected, soon involves both, and as the treatment is in all respects the same, according to the violence of the symptoms, this distinction has no practical utility.

Symptoms.—Acute or excruciating pain in the head, throbbing of the temporal and carotid arteries, flushed face, eyes injected and brilliantly reddish, contracted pupil, and a wild expression of countenance, characterize the disease when fully formed. These symptoms are preceded by various cerebral and febrile disturbances, sometimes violent delirium, at other times nausea and vomiting, or general convulsions. The bowels are usually extremely costive. There is also great intolerance of light and sound, incessant watchfulness, the skin is dry and hot, the pulse hard and quick, the tongue is dry and covered with a white fur, and there is intense thirst.

Special Causes.—Exposing the head to a hot vertical sun, violent exercise, intense study, excessive passion, external violence, metastatic gout or rheumatism, and repelled eruptions, are among the most frequent of the exciting causes.

Diagnosis.—Inflammation of the brain resembles, in many prominent symptoms, several other complaints, from which it is indispensable to distinguish it. From *mania*, it is known by the accompanying fever; from the *delirium of inflammatory fever*, by the delirium in the latter case succeeding instead of preceding the febrile symptoms; from the *delirium of typhus*, by the suddenness of its attack; from the cerebral irritation or determination to the brain arising from the *effects of loss of blood*, by the pallor of the skin and countenance in the latter case; and from *delirium tremens*, by the pallor of the surface and general tremor of the body and limbs which denote the latter.

Peculiarities of Treatment.—In most cases, inflammation of the brain is attended with synochus, or *high fever*, and requires thorough general and local cold treatment. The immersion-bath is excellent; or the patient may be enveloped in double or treble wet sheets, while the head is cooled with pounded ice, cold cloths, or the pouring-bath. The extremities must be carefully watched, and if the feet are not hot, like the rest of the body, they should be bathed in warm water. The constipated state of the bowels, of course, requires copious tepid injections. In some cases where the whole scalp feels excessively sore and tender, cold water feels disagreeable, and then tepid water is more

soothing, and, by more rapid evaporation, will cool the head as effectually as the cold water will in other cases. If a single sheet is employed for packing, it wil require to be renewed several times a day.

INFLAMMATION OF THE THROAT—QUINSY.—Under this head are included four distinct forms of inflammation of the throat, all of which are characterized by heat, redness, and swelling of the fauces, with painful and difficult deglutition.

Symptoms.—The first form of the disease under consideration is the *common quinsy*, or *tonsillitis* of authors, called also *cynanche* or *angina* in medical books. It consists of a swelling of the mucous membrane of the fauces and tonsils, by which the functions of swallowing, respiration, and speech are performed with great pain and difficulty; the accompanying fever is violent, and the disease terminates in a few days by resolution or suppuration. The second form is known as the *malignant*, or *ulcerated sore throat.* The attending fever is typhoid; the fauces exhibit a crimson flush, with ulcerations covered with mucus, and spreading sloughs, of an ash or whitish hue. This form is frequently epidemic. In the third variety, the redness is more florid, and is most violent at the lower part of the fauces; the swallowing is extremely painful and difficult. The fourth variety has been called *quinsy of the œsophagus;* the difficulty in swallowing is felt below the pharynx, and the food is generally rejected when it reaches the seat of obstruction.

Special Causes.—All of these forms of throat disease are most common in spring and fall, which fact shows that sudden changes of weather, or "taking cold," are their principal exciting causes.

Peculiarities of Treatment.—The wet compress, consisting of several folds of linen wet in cold water, must be promptly applied around the throat, and frequently renewed. The whole body must be well rubbed in the dripping sheet, or tepid half-bath, and then wrapped in the dry blanket, so as to produce moderate perspiration; or the general fever may be treated with the wet-sheet pack. In the malignant form, small draughts of iced-water should be frequently taken, and the coldest water, or pounded ice, applied to the throat whenever the morbid heat is troublesome.

INFLAMMATION OF THE LARYNX—LARYNGITIS.—This disease, in some of its symptoms, resembles quinsy, and in a still greater number, the croup. It consists in a suppurative inflammation of the membranes of the larynx, extending backward to the membrane common to itself and the œsophagus, between which purulent matter is often formed

It is a disputed point whether Washington, in his last illness, was attacked with this disease or common quinsy; but it is certain that he died of antimony and the lancet!

Symptoms.—After the ordinary symptoms of fever, the voice becomes hoarse and indistinct; the breathing laborious, with a painful sense of constriction in the throat; the fauces are swelled and turgid, the swelling extending to the face and eyes, the latter sometimes protruding as in cases of strangling; the pulse is frequent, the tongue furred, and every attempt to swallow is attended with great distress, the muscles of deglutition being thrown into violent spasms, threatening the patient with instant death from suffocation.

Diagnosis.—It is distinguished from *croup* by the existence of a constant and voluntary hawking, rather than a forcible and involuntary cough; and from *common quinsy* by the absence of any considerable swelling of the tonsils.

Peculiarities of Treatment.—There is no material difference in the therapeutic management required for this and the preceding malady, except that indicated by the danger of immediate suffocation. Ice-water gargles should be freely employed, in conjunction with cold wet cloths to the throat, and the general tepid-bath, or wet sheet; and if the extreme sense of suffocation is not relieved in a few hours, the patient should be put into a full hot-bath for ten or fifteen minutes; if, however, this is impracticable, the hot fomentations to the abdomen should be resorted to occasionally, in connection with the general and local treatment already mentioned.

Inflammation of the Trachea—Tracheitis—Cynanche Trachealis—Bronchlemmitis—The Croup.—This disease consists of a peculiar inflammation of the mucous membrane of the trachea, or windpipe, attended with a thick, tenacious, glairy secretion, which hardens, if the disease is not soon arrested, into a preternatural membrane, and produces death by closing up the air-passage in the larynx. In some few instances, however, it has been expectorated. A similar membrane is also sometimes formed in the bowels, bladder, or uterus, and cast off in the form of a tube, or of fragments resembling, and sometimes mistaken for portions of the mucous membrane.

Symptoms.—The *first stage* is denoted by a ringing cough, to which many children are subject on taking cold, attended with little or no change in the breathing or voice. This may be called the premonitory stage. In the *second stage* there is a shrill, ringing cough, with difficult breathing; the voice is altered, hoarse, and broken; the breathing is sometimes hissing and at other times creaking or crowing; the eyes

are heavy, watery, and bloodshot, and many patients die before the disease progresses further. In the *third stage* the cough and voice are stridulous, the respiration is laborious and suffocative, and the case is generally regarded as hopeless. The cheeks, eyes, and nails manifest a purple redness; the complexion is often mottled, or the flush of the cheek is circumscribed; the pulse is very small and frequent. In the *fourth stage* the voice is whispering and low; the cough less frequent, and scarcely audible across the room; the trachea is coated with effusion; the face is leaden, the eye filmy, and the extremities cold, and final insensibility is gradually closing the scene.

Special Causes.—The croup most frequently attacks children between the ages of one year and twelve, though occasionally it occurs in infants at the breast; and very rarely in adults. Sudden alternations of temperature, especially going from a heated, ill-ventilated apartment to a humid atmosphere, or *vice versa*, with little or no attention to bathing habits, are among the prominent circumstances which co-operate to produce this disease.

Peculiarities of Treatment.—As the danger from this disease consists in the effusion which concretes into the artificial membrane, the treatment should contemplate the arresting of this secretion at the earliest possible moment. The whole throat must be instantly enveloped in several folds of *very cold* wet cloths, and these should be very frequently changed until the respiration becomes free. If the fever is not very high, the whole body should be bathed in tepid water at about 70°, and then packed in the dry blanket, until the heat returns, or perspiration takes place. If the general fever and heat of the surface are considerable, the wet-sheet pack is the best, to be renewed occasionally, and managed in all respects as for a common fever. Attention to the bowels, cold extremities, irregular temperature, etc., is required, as in all febrile and inflammatory complaints.

When called to a patient, after the partial or complete consolidation of the tenacious secretion, evinced by extremely painful and suffocative breathing, and constant but unavailing efforts to expectorate, warm water should be copiously drank, and the throat tickled with the finger or a feather, so as to provoke moderate vomiting. Nearly every case of croup can be cured by a prompt recourse to these measures on the first attack. But all treatment may fail in the third and fourth stages of the disease. The preternatural membrane has, in a few instances, been expectorated in fragments, and the patient recovered; but usually its formation is fatal.

INFLAMMATION OF THE PAROTID GLAND—PAROTITIS—MUMPS.—

The mumps consist of a painful, unsuppurative swelling of one or both parotid glands; it is contagious, and often epidemic; it is often accompanied with swelling of the testes in males, and of the breasts in females

Symptoms.—The tumor is at first movable, but soon becomes diffused to a considerable extent; it increases till the fourth day, and often involves the maxillary glands in the inflammation. It is attended with but slight febrile disturbance, and gradually declines after the fourth day.

Peculiarities of Treatment.—Very little medication is required in ordinary cases. Abstemious diet, the wet sheet whenever the whole surface is affected with feverish heat, and the application of a wet linen cloth, covered with a dry one, to the inflamed part, whenever this is very hot or painful, constitute the remedial plan. Whenever metastasis occurs to the testes or breasts, the full warm-bath should be employed, succeeded by wet compresses to the part affected, well covered, so as to produce the fomentation or poultice effect.

Inflammation of the Lungs—Pneumonia—Pneumonitis—Peripneumony—Lung Fever—Pleurisy.—All of these terms have been employed to designate the same essential disease, which is an acute inflammatory condition of some part or all of the substance of the lungs, or of their surrounding membranes, or of both. Medical authors apply the term *pleurisy* to the disease when it primarily attacks the pleura; and the term *pneumonia*, or *pneumonitis*, when the primary attack appears to be in the parenchyma, or substance of either or both lungs. The term *peripneumonia notha*, or *bastard pneumonia*, has been given to a modification of the disease, attended with a low, typhoid fever of the nervous type, which has sometimes prevailed as an epidemic. Practically, all these distinctions are useless; for whether the inflammation first affects the investing membranes or the substance of the lungs, it soon involves both; and precisely the same treatment is indicated whether we call it one or the other of these technical names.

Symptoms.—Sometimes the constitutional symptoms appear first, as rigors, flushed, purplish face, injected appearance of the eyes, furred tongue, etc., and sometimes the local symptoms precede; these are great heat and sense of weight about the chest; dull, deep-seated, or acute pain; short and dry cough, with a slight mucous expectoration; frequent, short, and anxious respiration. In a day or two the expectoration becomes viscid, and more or less rusty-colored, yellow, or bloody. The pulse is full, strong, and quick, or small, weak, and frequent, as the fever approximates the inflammatory or typhoid type. Dr. Shew

in his Manual, mentions "no pulse" as among the symptoms, but this is most assuredly a mistake.

Terminations.—This disease terminates by *resolution*, *suppuration*, *gangrene*, *effusion*, or *hemorrhage*. Under thorough water-treatment from the outset, it has always, within the scope of my experience and observation, terminated very promptly by resolution.

Special Causes.—Extreme vicissitudes of temperature, unequal exposure of the body, cold or wet feet, exposure to wet or cold when the body is in a state of exhaustion from sleeplessness or over-exertion, are especially conducive to this disease.

Peculiarities of Treatment.—If the general febrile symptoms precede the local, the wet sheet is to be resorted to, and repeated according to the degree of superficial heat. When the local pain, cough, difficulty of breathing, etc., appear, the chest-wrapper should be constantly worn, covered with a dry cloth, and renewed five or six times a day. The shallow tepid-bath, or if this is impracticable, the tepid sitz-bath, should be employed once or twice in twenty-four hours. When the heat is unequally developed, the pulse low, the patient extremely prostrated, and the extremities pale or cold, the warm sitz and foot-bath are serviceable. Free tepid injections are generally advisable; and when the expectoration is painfully sticky and scanty, warm water-drinking, to the point of slight nausea, or even moderate vomiting, will afford speedy relief.

Inflammation of the Heart—Carditis.—Whether the muscular substance of the heart is ever the seat of an inflammatory affection which is capable of distinct recognition, is a disputed point. But inflammation of its investing membranes, though a rare disease, is recognized in all standard works; as *pericarditis*—inflammation of the heart-purse, or pericardium; *endocarditis*—inflammation of the internal membrane which lines the cavities of the heart. For all practical purposes, they may all be considered as simply inflammation of the heart.

Symptoms.—With general febrile disturbance there is more or less acute pain under the left nipple, toward the lower extremity of the breast-bone; this pain radiates toward the left armpit, and sometimes extends downward to the elbow or wrist; the pain is increased by pressing upward against the diaphragm, and by lying on either side. The pulse may be full, hard, regular, and jarring, or small, rapid, unequal, and intermitting; there is great difficulty of breathing, an insupportable sense of oppression, frequent sweats, often alternated with very dry and hot skin. The countenance is pale, sharp and marked

with great anxiety and terror; sighing, sobbing, and hiccough are frequent, and sometimes delirium, convulsions, or insomnolence attend.

Special Causes.—Among the predisposing causes of this affection Hooper mentions, "the male sex, and the age from ten to thirty." If he had said that males between the ages of ten and thirty are most subject to the disease, his talk would have been rational; but to put down such circumstances as *causes* is flat nonsense. The most common cause of heart diseases is the allopathic treatment, *alias* maltreatment of gout and rheumatism, which produces a metastasis of arthritic inflammation from the membranes of the joints to those of the heart.

Peculiarities of Treatment.—The hydropathic management is precisely the same as for inflammation of the lungs.

Inflammation of the Liver—Hepatitis.—Acute inflammation of the liver is, in this climate, a rare disease; but is rather frequent in hot countries, especially with those who indulge freely in flesh-eating and spirit-drinking.

Symptoms.—Pain in the right side under the short ribs, increased by a full inspiration, or by lying on the left side; dry, husky cough, shortness of breath, shooting pains about the chest, sympathetic pain in the right shoulder, yellow appearance of the white of the eye, and sometimes yellow skin; the urine is high-colored, and there is either costiveness or diarrhea.

Chronic inflammation of the liver—*hepatitis chronica* of the books—often manifests some degree of most of the symptoms above-mentioned, but is distinguished by the absence of general fever.

Peculiarities of Treatment.—Apply the wet girdle around the upper part of the abdomen, over the seat of the principal pain; in all other respects manage as in the case of inflamed lungs. The bowels should be thoroughly cleansed in the outset with warm water enemata.

Inflammation of the Spleen—Splenitis.—This is an exceedingly rare disease. It is known by severe pain in the left side opposite the liver, with a sense of heat and weight, and considerable fullness and tenderness; the pain is increased on pressure. The treatment is the same as for inflamed liver.

Inflammation of the Stomach—Gastritis.—Dr. Good distinguishes acute inflammation of the stomach into two forms, *adhesive* and *erythematic*. In the former variety the fever is high, or inflammatory; in the latter, low, or typhoid.

Symptoms.—With general fever there is severe fixed pain and burning heat at the pit of the stomach; painful deglutition; the pain is increased by pressure over the stomach; frequent vomiting, hiccough, sudden and extreme prostration; hard, wiry, rapid, and often irregular and intermitting pulse; intense thirst; restlessness and anxiety; tongue red, parched, and of a glazed appearance. Frequently the inflammation extends to the bowels, attended with diarrhea and great tenderness of the abdomen, constituting the *gastro-enteritis* of authors.

Special Causes.—In a majority of cases gastritis is the effect of powerful irritants or chemical poisons taken into the stomach. It is sometimes produced by drinking largely of very cold water when the body is excessively heated by exercise, especially in persons whose stomachs are enervated by spirituous liquors. Unripe fruits, decayed vegetables, and putrid animal food, sometimes excite it.

Peculiarities of Treatment.—Apply wet cloths freely to the whole abdomen, of the temperature which feels most agreeable and soothing to the patient. Generally quite cold water answers the best. Small quantities of ice or iced-water may be frequently taken. Drink *ad libitum* of water of a moderate temperature—60° to 70°. Tepid injections are generally necessary; when diarrhea attends they may be used cold. The entire wet sheet envelopment should be employed two or three times a day when the febrile heat is general and excessive.

Inflammation of the Bowels—Enteritis.—This disease, like gastritis, is divided into the *adhesive* and *erythematic* varieties, by Dr. Good. The former variety is attended with obstinate constipation; the latter with diarrhea.

Symptoms.—With more or less of general fever there is acute pain in some part of the abdomen, gradually extending over the whole; the pain is increased by pressure, and accompanied with tension and swelling. The patient lies on the back with the knees drawn up, and can scarcely suffer the weight of the bed-clothes. The bowels are usually obstinately constipated, but sometimes diarrhea attends; and there is constant nausea, and more or less vomiting of bilious and sometimes of highly offensive fœcal matter. The pulse is frequent, hard, and contracted.

Special Causes.—Long-retained and hardened fœces; constipating food; irritant poisons; impure aliments.

Diagnosis.—Enteritis is distinguished from *colic* by the presence of fever. In colic the pain is diminished by pressure.

Peculiarities of Treatment.—The constipated state of the bowels requires the free employment of copious tepid injections; in all other

respects the treatment is the same as for gastritis. It is not advisable, however, to resort to the injections until the heat and tenderness of the abdomen has been somewhat reduced by the external applications. When severe diarrhea occurs, the warm sitz-bath and cool injections may be occasionally employed to advantage.

Inflammation of the Peritoneum—Peritonitis.—Authors distinguish three varieties of acute peritoneal inflammation: *peritonitis proper*, when the lining serous membrane of the abdomen is generally affected; *omentalis*, when the omentum is the principal seat of disease; and *mesenterica*, when the inflammation affects principally that portion called the mesentery.

Symptoms.—The usual accessory symptoms of general fever are succeeded by a sense of heat and pain in the abdomen, usually confined to one part, but gradually becoming diffused. There is great tenderness or soreness of the belly, without inclination to go to stool, and a considerable degree of tension and swelling comes on, which ordinarily increases for several days; the patient finding most relief when lying motionless on the back, with the knees somewhat elevated. The tongue is not much altered at first; the pulse is small, weak, and very frequent. This disease frequently attends as a symptom of puerperal fever, which fever is generally the result of bad management during the period of childbirth.

Diagnosis.—It is distinguished from colic by the pain being increased on pressure, and frequency of the pulse. It is not so easily distinguished from enteritis; but this is of no consequence, as the treatment is in all respects precisely the same.

Inflammation of the Kidney—Nephritis.—*Symptoms.*—General fever, pain in the region of the kidney, extending to the groin and along the ureter to the neck of the bladder. The pain is deep-seated, often dull and obscure, but always increased by the erect posture, by coughing or sneezing, or by firm pressure. It is also increased by straightening the leg of the affected side. To avoid this the patient instinctively reclines on the affected side, and bends the limb so as to relax the muscles of the groin. There is frequent desire to urinate, with great difficulty or inability to expel the contents of the bladder. The urine is generally bloody at first. The tongue is white, the pulse is hard and frequent, the bowels are constipated, the abdomen is tympanitic, with wandering pains, and the patient labors under great depression of spirits.

Special Causes.—Acrid diuretics, hard water, gravel, violent exercise of the muscles of the back, hardened fœces in the colon.

Diagnosis.—It may be distinguished from *lumbago* by the pain following the course of the ureter, and by the difficulty of urination.

Peculiarities of Treatment.—If the fever is not violent, and the heat of the surface is irregular, the warm hip-bath will alleviate the pain. If the heat of the surface is great and uniform, the cold hip-bath will produce the greatest relief. One or the other should be frequently employed, with general and topical treatment, as in other visceral inflammations.

Inflammation of the Bladder—Cystitis.—Idiopathic inflammation of the bladder does not often occur. It does, however, sometimes result from the common causes of inflammation, but is more frequently the consequence of gravel, stone, long retention of urine, maltreated gonorrhea, and such drug-irritants as cantharides, ardent spirits, turpentine, and various essences and balsams.

Symptoms.—General fever; acute pain, swelling, and tension in the region of the bladder; pain and soreness increased by pressure above the pubes, or in the perineum; vomiting; tenesmus; frequent micturition, with great difficulty in discharging the urine; heat and smarting in the urethra; great general irritation, restlessness, and anxiety.

Peculiarities of Treatment.—On account of the structure of the urethral passage, the warm hip-bath should be at first employed for half an hour, or until sensible relief is experienced. This should be succeeded by the cold compress, which should be worn constantly and very frequently renewed, occasionally alternating with the warm hip-bath. The febrile symptoms are to be treated with the wet-sheet pack, followed by the dripping sheet or tepid half bath, as often and whenever they are indicated by the general heat. The vomiting may be relieved by warm water-drinking, followed by sips of cold water or bits of ice. The tenesmus requires copious injections of warm water, followed, after the bowels have acted freely, by the injection of as much cold water as the bowels can conveniently receive. The warm foot-bath is useful when there is the least tendency to cold extremities.

Inflammation of the Uterus—Hysteritis—Metritis.—This disease has been divided into two varieties—*simple*, when occurring in the unimpregnated organ; and *puerperal*, when attacking the womb soon after delivery.

Symptoms.—Nearly every symptom characterizing inflammation of the bladder attends also inflammation of the uterus; in the disease under consideration there are the additional symptoms of pain extending with great severity to the loins, and shooting down the thighs, and an

increase of pain in the hypogastric region on the patient's making a deep inspiration. There is also a sense of weight and bearing down, with a frequent, small, and wiry pulse.

Special Causes.—Suppressed menstruation, extraordinary mental emotion, astringent or irritating injections.

Peculiarities of Treatment.—The treatment for the preceding disease is equally applicable to this.

Inflammation of the Testes—Orchitis.—This affection is readily known by the pain, heat, redness, and swelling of the part affected; it is attended with more or less general fever. It only requires the constant application of water, either by compresses or the hip-bath, of such temperature as is most soothing to the pain; and the wet-sheet pack or tepid full-bath, according to the degree of general heat.

CHAPTER III.

ARTHRITIS.

Arthritic inflammation comprehends the various forms of gout and rheumatism. The peculiarity of this kind of inflammation consists in its being confined mainly to the fibrous tissues—the muscles, and structures around the joints. Its character is also erratic, often shifting its seat of morbid action from slight causes. The diseases included under the present head may be grouped as in the following arrangement:

Gout.	Regular, Atonic, Recedent, Misplaced.	Rheumatism.	Inflammatory, Articular, Lumbago, Sciatica, Muscular, Chronic.

Gout—Podagra.—Dr. Good tells us *(Study of Medicine)* "that the predisposing cause of a gouty diathesis, when it first forms itself in an individual, is plethora, or the state of the system produced by full living and indolence." Strangely inconsistent with this remark the same author observes: "There is no disease to which the human frame is subject that has led to such a *variety of opinions* both in the

ory and practice, many of them *directly contradictory* to each other, as the gout; and I may add, there is no disease concerning the *nature* and *treatment* of which physicians are so little agreed." Nothing can be more conclusive of the absurdity of the whole philosophy of the popular system, and the empiricism of its whole practice, than this general agreement about the producing cause of a disease, and this general disagreement about its nature and treatment!

Symptoms.—*Regular* gout is characterized by a violent inflammation and swelling of the joints, enduring for several days, and gradually subsiding with itching and desquamation of the cuticle. It usually comes on an hour or two after midnight, with excruciating pain in the joints of the great toe, which grows worse as the day advances, gradually ceasing toward evening, to return with more or less violence the next morning; and so on for several days. The attack is preceded by various symptoms of digestive derangement, and with coldness, numbness, and cramps of the extremities. The *atonic* or *disguised* form is attended with greater general debility and worse dyspeptic symptoms, while the affection of the joints is but slightly painful and inflammatory. The local affection often alternates with the symptoms of indigestion, when pain in the stomach, nausea, vomiting, eructations, etc., occur, and the patient is dejected and hypochondriac. Cramps in the trunk and extremities are common, and there may be either obstinate costiveness or diarrhea. Sometimes the affection of the joints alternates with a disturbance of the viscera of the chest, producing palpitation, syncope, or asthma; at other times with the head, which is affected with vertigo, cephalalgia, and sometimes even with palsy or apoplexy The *recedent* or *retrograde* form is marked by a sudden subsidence of the inflammatory state of the joints, succeeded immediately by an affection of some internal part, where is thenceforth the seat of the morbid manifestations. The head, heart, or lungs may be affected, producing the results named in the preceding remark. The *misplaced* variety is denoted by an inflammatory affection of some internal part or organ in a gouty diathesis, whether preceded or not by an inflammatory affection of the smaller joints, which, however, always very soon disappears.

Diagnosis.—Gout may be distinguished from rheumatism by its commencement in the small instead of the large joints; also by the peculiar manner of attack. When the gouty diathesis is strongly marked, the joints of the toes, and sometimes those of the fingers, are permanently enlarged and disfigured.

Causes.—The gout is emphatically the disease of the gourmand and the epicure. Wherever this diathesis prevails, there has nature

stamped, in painfully legible characters, the penalty of riotous living. A vegetable-eater and water-drinker has never, probably, been afflicted with any "joint-racking rheums" like unto this malady, since the creation, unless inherited. It is said, indeed, not to be exclusively confined to "high life," as it is occasionally known among the poor and laboring classes. No doubt the indigent and hard-working can eat and drink in such a way as to produce it. Yet we know this is very uncommon; and we must regard the disease as, in a general sense, the legitimate fruit of fashionable yet unnatural luxury. Flesh and wine represent the nature of its predisposing causes. The free indulgence in animal food of any sort, and the free use of fermented liquors of any kind, are among its prominent causes; and when to these are added concentrated and constipating food, with sedentary or indolent habits, we have the general condition which produces the gouty diathesis in its greatest intensity. The diathesis sometimes exists in those who eat intemperately and drink temperately, or *vice versa*.

In gouty subjects, the functions of alimentation so frequently overact those of elimination, that the surplus materials obstruct the capillaries, and the retained morbific matters so change the secernent action, that chalky concretions are formed in and around the cavities of the joints, in the ligaments, tendons, and membranes, in the little mucous bags—*bursæ mucosa*—which surround the joints, in the cellular substance, and even in the pores of the skin. The joints of the fingers and toes, more especially the latter, are frequently enlarged, hard, and tender, occasionally ulcerate, and sometimes form fistulous openings, through which oozes a whitish earthy matter, consisting mainly of urate of soda.

Treatment.—The indications are: 1. To relieve the paroxysm. 2. To prevent its return. These mean, in other words, to mitigate the pain, and restore general health. Cold or very cold wet cloths should be constantly applied to the affected parts until the pain subsides; or the feet or hands, when inflamed, may be held in cold water until the preternatural heat is subdued. There is no danger whatever of producing metastases to the internal organs—as bleeding, blistering, drastic purging, etc., do produce—by the application of cold water to the inflamed joints, provided the application is not continued beyond the point of reducing the temperature to the natural standard. The general feverishness attending the paroxysm requires the wet-sheet pack, so managed as to produce moderate perspiration, followed by the shallow tepid-bath. Water-drinking should be as copious as the stomach can bear without painful distension, and the diet should be of the "hunger-cure" kind.

To overcome the gouty diathesis requires a systematic employment

of the water processes, with the strictest general regimen. A daily pack for an hour, followed by a plunge, dripping sheet, or half-bath, a daily tepid shallow-bath for ten minutes, with the pail douche over the shoulders, a daily hip-bath at about 65° for fifteen minutes, a daily foot-bath at about the same temperature for ten minutes, constitute the average number and strength of the bathing part of the regular treatment. In addition to all this, the douche may be applied to the affected part with as much force as can be borne without much pain, and moderately along the spine, two or three times a week. With these processes the patient should exercise all that his strength will admit of, short of absolute exhaustion, and drink all the water the stomach can endure without pain. The diet must be plain and unconcentrated, consisting mainly of vegetables, ripe fruits, and unbolted farinaceous preparations. Nearly all medical authors agree that gouty subjects ought to be put upon an *abstemious vegetable diet.* Even many writers who insist that man is naturally omnivorous, and cannot subsist on an exclusively vegetable diet, seem to forget their darling theory, and prescribe for this disease what they specially interdict in almost every other.

The bathing part of the treatment may be managed in various ways, according to convenience, with equal efficacy. The following plan, with such modifications as circumstances will naturally suggest, is adapted to all ordinary cases: In summer, a plunge-bath on rising in the morning, followed by a long walk; at ten A.M., the pack and douche; at four to five P.M., half-bath and pail douche; at half-past eight P.M., sitz-bath. A foot-bath may be taken at either nine A.M., five to six P.M., or evening, or at all of those times. In winter, a pack and half-bath in the morning; douche at ten A.M.; half-bath at four to five P.M.; sitz in the evening; foot-baths as above.

Gouty patients who have been drugged extensively, their nerves enfeebled and their constitutions shattered with opium, colchicum, veratrum, elaterium, antimony, etc., must be managed with more care and tenderness. They will not bear as cold nor as vigorous treatment. For such, the pack and dripping sheet, the tepid shallow-bath, and occasionally, when they become unusually tender and irritable, the full warm-bath, followed by the tepid pail-douche, are the best leading water appliances.

Crises in Gout.—While under treatment, gouty patients are liable to critical disturbances in the form of boils, diarrhea, and particularly to a general feverishness, during which all the affected parts, and sometimes the whole body, becomes highly and suddenly inflammatory and painful. The full warm-bath, or the moderately hot bath, is useful

once or twice during the latter form of critical disturbance, which usually lasts several days. Diarrhea, if severe, requires the warm sitz-bath and cool injections; boils need nothing but wet compresses. Whenever the crisis is severe, all active treatment should be suspended; wet cloths, or cold water in any convenient way, may, however, be applied to swelled and painful parts during the crisis the same as at other times

Rheumatism.—Like gout, rheumatic affections are almost invariably connected with derangements of the digestive apparatus, and generally preceded by unusual disturbance in the functions of the primary nutritive organs. Some authors, indeed, maintain that gout and rheumatism are convertible maladies, often blending together, or running into each other, in their varied local manifestations. In fact, rheumatism might very well be defined as gout of the larger joints; while the stiffness, lameness, and rigidity of the muscles, and the thickening and swelling of the structures in and around the joints, are about as common to either manifestation of the arthritic diathesis.

Symptoms.—Inflammatory rheumatism presents all the essential symptoms of inflammatory fever, or synochus, with the addition of extreme soreness and tenderness over the whole surface of the body, and also acute pain in some one or more of the larger joints, or in the small of the back, rendering all motion of the body and limbs extremely difficult and painful The patient is often unable to get on or off the bed without assistance, and then the effort is attended with great suffering. The *articular* variety has been called *rheumatic fever*, or *acute rheumatism*. It differs from the former in being attended with much less general pain and soreness, and a much greater inflammatory action and swelling of some one or more of the large joints and surrounding muscles, generally the hip, knee, elbow, or shoulder. *Lumbago* is the variety in which the pain is felt chiefly in the loins, usually shooting upward. In the form called *sciatica*, or *coxalgia*, the pain is felt mostly in the hip-joint, the disease also being attended with an emaciation of the nates or buttock of the affected side, or an elongation of the limb. In the variety called *muscular*, the pain is experienced mainly in the muscles of the diaphragm, or in the intercostal muscles between the ribs, when the pain is greatly increased by a full inspiration. This form has been called *pleurodyne*, *pleuralgia*, and *spurious pleurisy* by [illegible] and the patient

fever, and but slight occasional febrile paroxysms, and with very little perceptible swelling. This form of rheumatism is almost always relieved temporarily by warmth, hot applications, stimulating liniments, etc., while all the other forms are frequently aggravated by them.

The fever attending rheumatic attacks is peculiarly accompanied with frequent and irregular sweats, which, however, do not prove in any sense critical, nor exert any marked influence upon the course of the disease.

Causes.—Unusual exposures to wet and cold while the body is in a state of exhaustion or obstruction, seem to be the general producing causes of all forms of rheumatic affections.

Treatment.—The proper management of the first, or inflammatory variety, is almost identical with that of inflammatory fever. In some cases where the joint or joints most affected are so tender that the least motion produces excruciating pain, a combination of relaxant and cooling processes will give prompt relief, as the warm fomentation, or warm douche, followed by the coldest wet cloths or pounded ice. The articular form requires a less vigorous application of the wet sheet, or other general cold treatment, but a more persevering application of cold compresses to the affected joints. Lumbago and sciatica, and that form called muscular, in addition to moderate general treatment, are relieved with the greatest facility by the hot fomentation to the parts affected with pain, stiffness, and rigidity, followed by the cold covered compress, or, what is better still, the warm douche followed by the cold, the temperature and force of the stream to be regulated in some degree by the patient's feelings. Chronic rheumatism, in whatever form manifested, requires the same general management as gout, the leading curative indication being to restore the general health. As constipation is an almost universal concomitant or antecedent circumstance, especial attention must be given to the state of the bowels, which should be kept free by means of injections, and an opening, plain diet.

So long as the *mercurial mania* rages among the medical gentlemen of the allopathic school, so long will the hydropathic phyician be continually called upon to treat many anomalous varieties of chronic rheumatism, *made such* by the *mercury* with which the patient has been dosed in the treatment of some acute disease. Such patients are peculiarly sensitive to vicissitudes of weather, and do not bear as cold treatment as those whose systems have never been mercurialized. The wet-sheet pack, followed by the tepid half-bath, once a day, the tepid half-bath followed by the pail douche, and the occasional employment of the warm-bath, followed by the pail douche or shower, constitute the best general plan of managing *mercurial rheumatism.* Some

times the treatment will set the remains of the mineral, which has long lain dormant, as it were, in the system, in motion, and reproduce salivation, spongy gums, fetid breath, metallic taste, or other evidences of mercurial action. During this mercurial excitement, no very active cold treatment should be employed. The tepid sponge-bath, or half-bath, with such local applications as the local pains demand, the temperature being such as feels most agreeable to the part affected, may be employed until the manifestations of mercurial action subside, when the regular treatment may be resumed. When the whole surface becomes extremely susceptible and sore, the hot-bath, followed by the tepid wash or pail douche, should be employed.

The general regimen applicable to gout is equally so to rheumatism.

CHAPTER IV.

INDIGESTION.

Wherever the refinements of civilization and the luxury of plenteousness exist, dyspepsia, in some of its protean shapes, seems to be the general condition of the inhabitants. I do not agree with Dr. E. Johnson *(Results of Hydropathy)* that "constipation is not a disease of the bowels;" nor do I coincide in his notion that mental excitement is the sole cause of indigestion. I admit, however, it is one among several very efficient causes of that extensive train of morbid maladies which we call dyspepsia.

Nosologists have enumerated more than one hundred distinct diseases, to which they have assigned specific characters, and which they have scattered through various and dissimilar genera, orders, and classes; yet each is nothing but a mere circumstance of deficient or imperfect performance of the digestive function. Thus Dr. Good, in his elaborate system of pathology, elevates such symptoms of digestive derangement as heartburn, water-brash, flatulence, depraved appetite colic, constipation, teething, etc., to the rank of idiopathic maladies. I shall undertake to associate all these manifestations of one general morbid condition into a more natural arrangement, and treat of them in the present chapter. The propriety of thus grouping together several classes of diseases which have been usually considered not only as idiopathically distinctive but as demanding widely different and even oppo-

site methods of treatment, is enhanced by the fact that they are all really cured by the same general plan of hydropathic medication

Diseases of Indigestion.

Dyspepsia: Morbid Appetite, Morbid Thirst, Heartburn, Flatulence, Constipation, Sick Headache.	Cholera: Bilious, Flatulent, Spasmodic, Infantum.
Liver Complaint: Chronic Hepatitis, Jaundice, Gall-Stones, Duodenitis.	Diarrhea: Feculent, Bilious, Mucous, Milky, Serous, Tubular.
Misdentition: Toothache, Tartar of the Teeth, Excrescent Gums.	Intestinal Concretions: Bezoar, Calculus, Scybalum.
Colic: Iliac Passion, Painter's Colic, Wind Colic, Surfeit, Constipated Colic, Constrictive Colic.	Worms: Alvine Worms, Anal Worms, Erratic Worms.
	Hemorrhoids: Blind Piles, Bleeding Piles. White Piles, Caruncular Piles.

That the majority of the diseases named in the above table are symptomatic of indigestion all will allow; but those who are accustomed to regard *worms* as natural to the alimentary canal, and those who consider the *piles* as a local affection, will object to the tabular arrangement. But I will venture to assure every physician who will carefully investigate the subject, that he will find the stomachs and bowels of children or adults infested with vermin in very nearly the ratio that foul secretions and crude ingesta evince disordered digestion; and if he will attentively study the history of hemorrhoidal affections, he will find them, in some form, almost as general as, and almost invariably preceded by, constipated bowels. Still greater will be the dissent of those who have imagined epidemic or spasmodic cholera to depend on specific contagion, ozone, electrical or magnetic states of the atmosphere, or planetary or other *unearthly* influences, to the idea that all the choleras of medical books are dyspeptic affections. But, whatever may be their predisposing or exciting causes, it is sufficiently apparent that the actual condition of the disease is that of extreme derangement and intense irritation of all the organs auxiliary to digestion.

Dyspepsia.—Depraved appetite, unnatural thirst, flatulence, acrid eructations, heartburn, or water-brash, irregular bowels, and sick head-

ache, are among the multitudinous symptoms of dyspepsia; yet the disease may exist with the absence of either one or the majority of them.

Symptoms.—Fastidious or irregular appetite, constipation, or diarrhea, or those states alternating, sense of weight or other feeling of distress after eating, food digested with difficulty, depressed spirits, disturbed sleep, occasional pain or tenderness in the epigastrium, a feeling of languor, which is relieved by taking food, aversion to exercise of body or mind, are symptoms which, variously combined, designate the disease. Usually there is occasional palpitation or throbbing of the heart, furred tongue, and slow, irregular, or intermittent pulse.

Doctor Gully and some other authors distinguish dyspepsia into the *nervous* and *mucous* varieties. The term, nervous, is applied to the disease when occurring in persons of irritable temperaments, with a large development of the brain and nervous system; and the term, mucous, is applied to the disease as it appears in persons of more torpid or phlegmatic temperaments. The former generally results from mental shocks, excessive emotions, intense study, violent passions, and is attended with great pain or uneasiness in the stomach, spasms, gnawing or sinking sensations, capricious appetite, etc. The latter results more especially from sedentary habits and excesses in eating and drinking, and is attended with torpid bowels, and but little actual pain in the digestive organs.

Treatment.—No other disease presents itself under so great a variety of complications; and although the principles which regulate its treatment are very simple, there is an unlimited opportunity for the exercise of skill and tact in the management of a dyspeptic invalid. Usually we have to deal with fickle tempers, despondent minds, strong morbid appetites with weak resolutions, all of which circumstances are aggravated by the patient having previously doctored with all sorts of doctors, and swallowed every thing he could read of in the newspapers in the shape of nostrums.

All the resources of hygiene must be drawn upon, and adapted to the circumstances of each particular case. The nervous, feeble, restless individual, who is all activity with little strength, who has a constant disposition to move with no power to endure, must take moderate water-treatment, exercise gently, prefer sailing, riding, etc., to active walking, and sleep all that he is inclined to, even though it be late in the morning, or at other times of day; while the torpid, quiet, but more enduring person should employ more powerful water processes rise early, walk much, and practice gymnastics for amusement, unless he can find amusement in some light kind of manual or mechanical labor

The diet should be more plain and simple as the disease is more advanced and serious. Regularity in the alvine dejections is of first importance. The patient should, if possible, go to stool at the same time of each day, and if the diet does not, in a very few days, produce regularity in the discharges, cool or cold injections should be employed daily, soon after rising. As a tonic effect is always desirable, cool or cold water should be employed, whether the bowels are loose or constipated, except when affected with colic or griping. The sitz-bath and the abdominal compress are the important and ever-necessary local baths. The former may be resorted to two or three times a day, for ten or fifteen minutes, the temperature as cold as the patient can bear without producing a permanent chill, or disagreeable feeling of weakness and stiffness. The crash towel bandage is the best; the wet part should pass round the body, when it can be worn without unpleasant irritation or chilliness of the back; otherwise it should only extend across the abdomen from one side to the other. Foot-baths should not be neglected when there is a tendency to cold extremities. The most important general baths are the partial or complete wet-sheet pack, according to the general heat and reactive power, and the tepid half or shallow-bath. The plunge or douche may be employed under the restrictions heretofore specified; the dripping sheet is a good substitute for either of the other general baths when it is impracticable.

The hot fomentation to the abdomen is serviceable whenever indicated by severe headache, spasms, general restlessness, nausea, vomiting; and sick headache is relieved by drinking warm water, followed by sips of cold, and, in severe cases, the abdominal fomentation. When sick headache occurs periodically, warm water should be copiously drank on its first attack, to dilute and wash away the offending bile or other acrid fluids as soon as possible.

A good combination of baths for full or active treatment in an ordinary case, would be the following daily: Tepid half-bath five minutes and pail douche; wet-sheet pack, followed by moderate douche, plunge, or dripping sheet; sitz-bath at 60°, ten minutes, followed, after an hour's interval, by a foot-bath at 72°, five minutes; the first to be taken on rising; the second from ten to eleven A.M.; the third at four to five P.M., and again in the evening. The wet girdle should be wet and reapplied after each bath, and again at bedtime. In protracted cases requiring long course of treatment, it is advisable to omit the wet bandage occasionally for a few days, and then resume it again.

In many cases of dyspepsia there is a weak and relaxed, or a rigid and contracted state of the external abdominal muscles, especially frequent in those who have been addicted to crooked bodily positions, in-

tense mental excitement, sexual abuses, or the use of narcotic stimulants, as tobacco and alcohol. The free indulgence in tea and coffee also conduces to it; and fine, constipated food is among its producing causes. These cases require local manipulations, as kneading, pounding, rubbing, etc., the lower part and external muscles of the abdomen, not with sufficient violence, however, to cause pain. A trotting horse affords a good exercise. Climbing mountains, and walking rather fast over an uneven surface, are also peculiarly beneficial exercises.

Liver Complaint.—A morbid condition of the liver is as constant and as necessary a concomitant of indigestion as is a morbid condition of the stomach. In some forms of deranged digestion the stomach and bowels appear to be the seat of the more prominent morbid phenomena, and in others the liver presents evidences of being disproportionately affected. Its pathological conditions are various, but its functional derangements may all be comprehended under the general term of liver complaint.

Symptoms.—Chronic hepatitis is a state of passive or chronic inflammation of the organ. In addition to a variety of dyspeptic symptoms, there is sense of weight, fullness, or other pain in the region of the liver, which is increased by deep pressure; sometimes the pain is referred to the left side; at other times to the right shoulder, or between the shoulder-blades; there is frequently darting, irregular, and fugitive pains along the breast-bone and through the chest; some degree of enlargement or hardness is usually obvious to the touch under the short ribs of the right side; the countenance is sallow; the bowels are costive; the stools are clay-colored; the patient is torpid, inactive, and desponding, and there are occasional attacks of jaundice. Dropsy frequently follows this form of diseased liver. It is also generally attended with a dry, husky cough, and a slight hawking, or spitting of a thick, tenacious mucus, especially in the morning, when the sputa appears dark and carbonaceous, as though charcoal-dust had been diffused through it. The cough is immediately caused by the engorged or swelled liver pressing upon the diaphragm, and the viscid secretion of the mouth or throat is owing to the irritation of congested and acrid bile. This cough and expectoration may be distinguished from that which has its seat in the lungs or their appendages, by the *slow pulse*, and the prominent hepatic or dyspeptic symptoms.

Jaundice—the *icterus* of the books—has been commonly distinguished into the *yellow* and *black*, or *green*, according to the discoloration of the skin from impacted and partially putrescent bile, to which some authors have added the subvarieties of *biliary*—produced by a resorption of

bile; *gall-stone*—resulting from obstruction of the bile-ducts from inspissated bile; *spasmodic*—produced by spasmodic stricture of the bile ducts; *hepatic*—resulting from schirrus or induration of the liver; *infantile*—occurring in infants; and *black vomit*—the regurgitation of morbid bile into the stomach, and its ejection, mixed with dark, grumous blood. Jaundice, in a general sense, is known by debility, languor, inactivity, heat and pricking of the skin, bitter, nauseous, or acrid taste in the mouth, yellowness of the conjunctiva of the eye, and subsequently of the whole surface of the body; the bowels are irregular, the urine high-colored and yellowish, the pulse is usually slow and weak, the mind is downcast and gloomy, or listless, wandering, and irritable, and there is feverish heat and dryness of the skin. When the disease is protracted, the skin turns greenish, brown, livid or leaden, blotches appear in different parts, and the discharges from the bowels are dark, pitchy, and bloody. The special or immediate cause of jaundice is torpor or inactivity of the liver, by which the viscid particles which should be secreted in the liver, and passed off in the form of bile, are left in the blood.

The existence of *gall-stones* is known by the acute and sometimes excruciating pain they occasion when passing through the common bile-duct from the liver into the duodenum; this pain is felt in the epigastrium, extending to the right side and back, and occurs in severe paroxysms, with intervals of comparative ease. The pain suddenly remits when the calculus reaches the intestine.

Duodenitis is an inflammatory state of the mucous membrane of the duodenum, at the point where the bile enters this portion of the intestinal tract; it is occasioned by the contact of acrid and irritating bile, and known by a sickening, sinking, gnawing sensation just below the pit of the stomach, with tenderness to external pressure, often so great as to make the weight of the hand or of the bedclothes painful.

Treatment.—All that has been said in relation to the treatment of dyspepsia, applies with equal force here. There are, however, some modifications of the general plan of management required in some forms and stages of the disease, or rather group of diseases under consideration. The state or condition of liver disease described as chronic hepatitis, in which the bile is still imperfectly secreted, but its quality exceedingly vitiated, requires more especial attention to the stomach and bowels. Warm water emetics are serviceable to deterge the biliary ducts, whenever nausea, bitterness in the mouth, and unusual sense of fullness in the right side indicate obstruction; and if the bowels are costive, with general fullness and tenderness, tepid injections should be

freely employed until these symptoms are removed, when cool or cold ones should be substituted.

Jaundice presents many complicated varieties of morbid phenomena, all of which are usually denominated "*nervous debility;*" a term not entirely inappropriate, since the thick viscid blood, consequent on the retained matter of bile, being unable to penetrate freely the minute capillary vessels, where nutrition of the nervous, as well as the other structures, is effected, the nerves are really impoverished for want of sustenance. In this form of diseased liver, too, the skin is dry and feverish, or clammy and cold, in either case weak, obstructed, and bilious, yet bloodless. Reaction, though sometimes active and prompt, is always feeble and transient; hence we are to begin the general treatment with the gentler processes, employing water of a mild temperature, gradually intensifying the force and lowering the temperature of the baths, as the superficial circulation of the patient improves. The half-bath may be commenced at about 85° or 90°, and gradually reduced to 75° or 70°; the sitz may be employed at first at 75°, and by degrees lowered to 60°; the cold sheet half-pack, or entire warm sheet pack, is advisable at first, gradually proceeding to the ordinary wet-sheet envelopment as the skin becomes invigorated. In some cases, where there is considerable tendency to feverishness, the whole body will readily warm up in the wet sheet, and the glow increase for twenty or thirty minutes, when it will begin to decline, in spite of any amount of extra bedding. Such patients should be taken out of the pack as near the height of the reaction as possible, and bottles of hot water should be applied to the feet, and in extreme cases to the armpits also, to enable them to remain still longer enveloped. The dripping rub-sheet is one of the best appliances in cases of extreme torpor and bloodlessness of the surface, the temperature not being so cold as to leave a permanent chill.

It should be particularly borne in mind, that no patients in the condition of "nervous debility" under consideration, will tolerate *extremes* of treatment, be they hot or cold. There is not sufficient blood in the superficial capillaries to react against very cold impressions, and for the same reason steam or vapor-bathing, or the ordinary hot-bath, has a peculiarly relaxing and debilitating effect, a vigorous capillary circulation being just as necessary to defend the body against one extreme of temperature as another.

The existence of gall-stones only requires the hot fomentation and warm sitz-bath, with copious warm water drinking, to facilitate their passage, and mitigate the pain.

As duodenitis is caused directly by morbid and acrid bile, it will di-

appear whenever the healthful secretion of the liver is restored. Sometimes it disappears when the condition of the liver changes from chronic inflammation to jaundice—from morbid action to no action. Occasionally ulceration takes place from the long-continued corrosive effect of putrid bile, resulting in death suddenly and unexpectedly.

Misdentition.—Teething, tooth-edge, toothlessness, and deformity of the teeth, are placed by Dr. Good in the catalogue of diseases belonging to the genus before us. *Teething*, it seems to me, is rather a natural than a morbid process; and, although often accompanied with much pain and suffering, and various diseases, these are all owing to some obstruction or irritation in the digestive organs, producing a general feverishness of the system and an inflammatory state of the gums. *Tooth-edge* is the peculiar tingling or uneasy sensation experienced in the teeth from some kinds of grating or jarring noises, or from certain acids and acrid substances. *Toothlessness* results from constitutional defect, external violence, internal drug-medicines, decay, or old age. *Deformity of the teeth* is generally an unfortunate inheritance, for which the child is indebted to the bad dietetic or other habits, or infirmities, of one or both parents; a great degree of deformity, however, may be produced by bad habits in the dietetic and medical management of the child itself.

The diseases properly coming under the present head are, toothache, tartarous teeth, and excrescent gums, all specially connected with or dependent on depraved or impaired digestion. The history of all the animal creation, and of the whole human race, shows that there is a most intimate relation between sound, clean, symmetrical teeth and healthy, fine, vigorous gums, and correct dietetic habits. The uniformly healthy condition of the teeth of wild animals, and the general rotting state of those of domesticated animals illustrates this fact sufficiently.

The exciting cause of *toothache* is usually "taking cold." It may exist in connection with caries or ulceration of the teeth, or with extreme irritability of the dental nerve without structural decay. The cure may be found in holding tepid or cool water in the mouth, renewing it as often as it becomes quite warm, rubbing the face and neck with the hands dipped in cold water, the shallow foot-bath, and absolute fasting until the pain abates. Very few toothaches can hold out against a fast of twenty-four hours, even if no other medication is resorted to. Rubbing the teeth and gums smartly with a brush dipped in cold water, even until the gums bleed freely, often relieves toothache promptly.

Tartar of the teeth consists of concrete saliva hardened by the earthy

materials which it secretes. The remote cause is undoubtedly the excessive amount of earthy or extraneous ingredients taken into the system with the food and drink, more especially derived from hard water; and the immediate cause is deficient mastication, the food being soft and sloppy, and not demanding sufficient exercise of the teeth to keep them clean. In many instances the mouth is most foully disfigured by tartarous concretions which have destroyed the gums and alveolar sockets. The tooth-brush, aided by some mild dentifrice, is the best palliative we can employ. To effect a cure, the teeth must be cleaned by a careful dentist, and then the dietetic habits must be placed under physiological law.

Excrescent gums may be either soft, spongy, or fungous, or in the form of firm, unyielding lumps or hardened knobs; they are always symptomatic of scurvy, or some disorder of the digestive organs. They can only be cured by attention to the general health. Sometimes the excrescences, when considerably protuberant, have been extirpated with caustic, ligature, or the knife; but unless general health is restored, they will soon grow again.

Colic.—All those diseases comprised under the generic head of cholic, or belly-ache, are characterized by griping pain in the bowels, mostly in the region of the umbilicus, and attended with vomiting and costiveness.

Symptoms.—The species called *iliac passion* is accompanied with painful retraction or drawing in of the navel, and spasms of the muscles of the belly; the vomiting is exceedingly violent, ejecting bile from the duodenum, and often stercoraceous matter from the bowels; and even some cases the injections introduced into the rectum have been ejected by the mouth. This is the disease called *introsusception* or *intus-susception* in medical books, and so denominated from the circumstance that one portion of the affected intestine, constringed and lessened in diameter, has fallen into another.

Painter's colic—known also as *Devonshire colic*, *colica poicton*, and *colica rachialgia*—is so termed from the remote cause being the introduction of lead into the system, and hence mostly confined to painters. In the neighborhood of smelting furnaces, pigs, poultry, and other animals are said to be affected with this complaint. It is evinced by a pain at the pit of the stomach, at first dull and remitting, but gradually becoming more violent and continued, and, as it increases, extending upward to the arms, and downward to the navel, back, loins, rectum, and bladder, and frequently extending to the thighs and legs. From the navel it sometimes shoots with so much violence to each side

that the patient feels as if some person were cutting him in two. The external muscles are extremely sore and tender, and can scarcely bear the slightest touch. Momentary relief is occasionally experienced after the vomiting of acrid bile and slime, but the pain soon returns. In about a week or less, if recovery takes place, relieving sweats appear, and the bowels discharge large quantities of excrement, consisting of hard lumps, or scybala, mixed with blood and dirt-colored mucus, after which the patient is convalescent. Paralysis of the fingers, hand, and arm comes on after several attacks.

It may be poor consolation to wine-bibbers to know that litharge, and other preparations of lead, are extensively employed in the manufacture of sweet and sub-acid wines, and that where such wines are freely drunk, this kind of colic is very prevalent; nevertheless, such is the fact.

Dr. Samuel Cooper, author of a surgical dictionary, remarks: "During the sixteenth and seventeenth centuries, when preparations of lead used to be given in large doses medicinally, the colica pictonum and paralysis, in their severest forms, appear to have been very frequent."

Wind-colic—colica flatulentia—is evinced by acute pain extending to the pit of the stomach, accompanied with great fullness and flatulence, often impeding respiration; it is relieved by pressure, expulsion of wind, or bending the body forward. It is chiefly produced by crude or unripe fruits, long fasting, grief, fear, etc., and is a frequent attendant of dyspepsia and chronic diarrhea.

Surfeit—colica cibaria—is usually produced by loading the stomach with an excessive quantity or indigestible quality of food. Occasionally it results from poisonous vegetables or animals taken into the stomach. Various kinds of shellfishes, and several species of other fishes, are known to have been followed by an attack. It is characterized by pain, nausea, and dizziness, until vomiting takes place, terminating afterward in a griping looseness. There is also, in some cases, an eruption of the skin, with constriction in the throat, an intolerable sense of suffocation, swollen eyes, extreme thirst, and a burning heat over the whole surface.

Constipated colic—colica constipata—is caused by indurated fœces, or other intestinal concretions, and is known by severe griping pain, obstinate costiveness, great tension with little flatulence; the vomiting sometimes accompanied with fœces; the costiveness is attended with bloody strainings, terminating, when not fatal, in a free discharge of the infarcted matter.

The *constrictive* species—*colica constricta*—results from a permanent stricture existing in some part of the alimentary canal. Its symptoms are—a sense of stricture; a feeling of flatulence gradually passing off

by the stricture; the bowels tardy, and discharging with difficulty small liquid stools. In the early stage of the disease there are colic pains and costiveness, alternating with bilious diarrhea; after the disease has existed some time, solid fœces are rarely passed, and only after a great effort, and they are of an extremely slender caliber. Patients have been known to subsist more than thirty days without any evacuation from the bowels.

Treatment.—The general management of colic consists mainly in the employment of copious warm water injections, to free the alimentary canal of its accumulated contents, conjoined with frequent hip or half-baths, which may be either hot or cold, according to circumstances, to quiet pain, and overcome whatever inflammatory or spasmodic condition may exist. In some cases, hot water proves the best sedative, and in other cases, very cold water is most efficient. It is fortunate that in almost all cases, and probably in every case, when warm water fails in giving relief, cold water promptly succeeds. The desirable temperature can generally be very readily determined by the febrile or non-febrile character of the symptoms. If there is considerable heat and fixed soreness about the abdomen, with a general feverishness of the whole body, cold or very cold water is most appropriate; and when the whole body is inclined to coldness and torpor, and the abdominal pains are griping and periodical, hot water is indicated. In mild cases, the hot fomentation, followed by the cold compress, will remove all local distress. Wherever the hip or half-bath is employed, the abdomen and back of the patient should be thoroughly rubbed during its administration. The moderate drinking of water, or tepid water, assists the relaxant effects of the other processes.

In the first-named variety—*colica ileus*—the stricture of the intestine is sometimes so great as to produce a degree of strangulation, liable to be followed by inflammation and gangrene, especially if drastic or irritating purgatives are resorted to, as they generally are in old-school practice. The fœces in this, as in the other forms of colic, may be so hardened as to require the handle of a spoon, or some similar contrivance, to remove them from the rectum. For these reasons, as large a quantity of water as the bowels can well receive should be injected, and the process frequently repeated. The warm stream douche, followed by the cold dash, is excellent as a local application.

The second variety—*painter's colic*—demands, in addition to all the treatment required for the ileus form, thorough detersive and invigorating management. The wet-sheet pack, cold or warm, according to the external heat or coldness of the patient, followed by the dripping wet-sheet or tower-wash and this by the dry sheet and dry hand rub-

bing, will best accomplish the cleansing and strengthening part of the remedial plan.

The third variety—*wind*, or *flatulent colic*—the hot fomentation and a single injection are usually sufficient to remove. If it resist these means, the warm douche to the abdomen, followed by the dash of a pail of cold water to the belly and legs, will effectually disperse it.

The fourth variety—*surfeit*—requires a thorough warm water emetic, a free injection, and a rigidly-abstemious diet, or absolute abstinence, for a few days.

The fifth and sixth—*constipative* and *constrictive*—forms, are cured by a frequent and persevering employment of tepid injections and sitz-baths, as leading processes, assisted by hot fomentations, the wet-sheet pack, and other appliances, as the general symptoms indicate. Especial attention should be given to rubbing, kneading, gently pounding, or otherwise exercising the muscles of the loins and abdomen. The diet should be of the *coarsest* kind—cracked-wheat, rye-mush, Indian gruel, hard wheat-meal biscuits, good fresh ripe fruits, etc.

CHOLERA.—The group of diseases comprehended under this generic term, is characterized by vomiting and purging, gripings in the bowels spasms in the arms and legs, often flatulent eructations and dejections, with great anxiety and prostration. The usual succession of symptoms is—Vomiting, purging, spasms, prostration, and collapse. In the spasmodic cholera, however, the vomiting is generally preceded for hours or days with looseness or diarrhea. Cholera is distinguished from colic by the presence of purging, and from diarrhea by the absence of vomiting in the latter disease.

In the *bilious* variety—commonly known as *cholera morbus*—the vomiting and purging are copious and frequent, with a redundancy of bile. In the severest cases the vomiting is vehement, the dejections very painful, the spasms violent, and the agony intense. In the worst cases the extremities are cold, the pulse is small, frequent, and unequal, and the patient sometimes dies within twenty-four hours from the first attack. The exciting causes are usually a surfeit, acrid bile, indigestible articles of food, drastic purges, emetic drugs, especially tartar emetic, etc.

The *flatulent* form—*wind cholera*—is particularly characterized by the absence of bile in the discharges; the vomiting and purging are rare; but in their stead there is great and oppressive flatulence and retching, with windy eructations and dejections. This form of the disease is rather peculiar to dyspeptics.

Spasmodic cholera—called also *malignant*, *epidemic*, *Asiatic*, *Indian*.

blue, and *pestilential* cholera—is generally epidemic, though not contagious. The first symptoms are usually experienced during the night, sometimes commencing with a slight general uneasiness and moderate diarrhea; at other times the symptoms come on violently, and follow each other rapidly. In fatal cases death usually occurs at some period between six and twenty-four hours; in a few fatal cases the patient lingers two or three days. The ordinary course of symptoms is, more or less diarrhea; the discharges at first feculent, but soon presenting the appearance of rice-water or gruel; there are flying pains, or sense of coldness in the abdomen, as if purgative medicine were about to operate; the countenance is pale; there is nausea, vomiting, prostration of muscular power, and nervous agitation; cramps in the legs, arms, loins, and abdominal muscles, more or less severe; small weak pulse, intense thirst, and urgent desire for cold water; in most cases cold, clammy skin; all these symptoms may appear successively or almost simultaneously. In some cases the premonitory symptoms exist for eight or ten days; and sometimes the patient is prostrated at once. When the disease comes on suddenly, the cramps usually commence in the fingers and toes, rapidly extending to the trunk; the eyes are sunken, and surrounded by a dark circle; there is vomiting and purging of white matters mixed with flocculi; the features are sharp and contracted; the expression of countenance wild and confused. The face, extremities, and often the whole surface of the body, manifest a varying intensity of a leaden, bluish, or purplish hue; the extremities are shrunk, the nails blue, the pulse thready or wholly imperceptible at the wrist, arm, axilla, temple, or neck; there is great restlessness, incessant jactitation, severe pain in the epigastrium, loud moaning or groaning, difficult and oppressed breathing; difficult inspiration, with short and convulsive expiration; voice hoarse, whispering, or nearly suppressed and plaintive; the tongue is white, cold, and flabby, and the external temperature often sinks below 80°; convulsions recur at short intervals, or a constant tremor exists. The secretions of bile, saliva, tears, and urine are entirely suppressed, and a cadaverous odor exhales from the body. The patient retains his faculties to the last.

Either of the above symptoms may be disproportionately severe, or it may be entirely absent. Those usually regarded as pathognomonic are, watery dejections, blue appearance of the countenance or surface, thirst, coldness of the tongue, and pulselessness at the wrist.

The fourth variety—*cholera infantum*—is peculiar to infants, and prevails extensively during the warm season in nearly all of our cities. In ordinary cases the diarrhea precedes the vomiting for several days; but in severe ones vomiting also occurs from the beginning. The dis-

charges at first are composed of ordinary fœcal matters; but, as the disease progresses, they become watery and variously colored, from a dirty white to a brownish, and sometimes greenish hue. Sometimes these discharges are frothy, like yeast, and mixed with the food, which passes the bowels almost unaltered; in some cases the discharges are bloody, as in dysentery. There is raging thirst, the tongue is dry, but scarcely furred; the febrile heat is very irregular; the body emaciated; the skin grows dry and ash-colored; the abdomen is very much heated toward the termination of the disease; the pulse is small, weak, and frequent throughout. It usually runs its course in about three weeks.

Treatment.—Bilious cholera in its early stage requires copious warm water injections, and free warm water-drinking, to cleanse the whole alimentary canal as promptly as possible. When the discharges have existed for a considerable time, and the patient is greatly exhausted, or after the employment of the cleansing processes above named, frequent sips of cold water should be taken, and moderate cool injections employed after each dejection. The cold compress should be applied to the abdomen, and very frequently changed. When the griping is extreme, the hot hip-bath should be resorted to; and the cold hip-bath when there is much external heat and tenderness of the abdomen The wet-sheet pack and the pouring head-bath are appropriate and very efficacious, and often magically soothing processes, after the stomach and bowels are freed of their irritating contents.

The *flatulent* form may be relieved by hot fomentations or hip-baths, and moderately cool injections.

In indicating the appropriate hydropathic treatment for *spasmodic* cholera—the most *frightful*, yet not the most *fatal* pestilence of modern times—I feel no small degree of embarrassment; not that I regard the Water-Cure, which I claim to be a sufficient system in all other functional diseases, as an exceptional failure in this, but because it has no power to reclaim the dead; and in many cases an attack of this disease is a death-stroke. Persons of gross habits, the intemperate, the debauchee, the riotous liver, and those whose dietetic habits have been peculiarly enervating and constipating, are especially and almost exclusively the subjects and the victims of this penal scourge. The nature of the disease is an intensely irritated or peculiarly inflammatory state of the mucous membrane of the stomach and bowels; the diarrhea, which the drug-physicians regard and treat as though *it* were the essential disease, being a mere indicent, effect, or symptom of this general morbid condition. That debility and obstruction in the primary nutritive functions constitute the essential condition, while inflammatory

action and serous discharges constitute the leading manifestations of the disease, is rendered probable, if not proved, by the fact, that no individual of correct dietetic habits—such habits as are advocated in this work—ever yet had the disease. This is certainly true of the Grahamites and Vegetarians of New York, in all the seasons—1832–34 and 1849—that it has prevailed epidemically; and as far as I can learn—and I have taken no little pains to ascertain the fact—throughout the wide world.

When I say that dietetic errors are prominent among the producing causes of malignant cholera, I do not mean exclusively habits of gluttony and intemperance. Many persons, intending to diet preventively, have dieted in exactly the way to produce it. Medical councils, boards of health, and sanatory committees have generally given authoritatively more bad than good advice, both as respects avoiding the disease and curing it. The preventive measures officially recommended in New York in the *hot* season of 1849, consisted mainly of "flannel next the skin, the *warm* bath occasionally, a greater proportion of *animal* food, and fine, *constipating*, farinaceous food." Under the delusion that "the diarrhea was the cause of all the symptoms which followed, and that if the diarrhea could be prevented, no cholera could occur," rice, dried beef, bakers' fine bread, with animal food two or three times a day, and the almost entire prohibition of fruits and vegetables of all kinds, became substantially the preventive plan of living—a plan which was faithfully followed, *even unto death*, by many persons and several physicians in this city. The true preventive plan is exactly the opposite in every respect.

The drug-treatment of cholera would be amusing for its inconsistencies, did its consequences not border so closely on the tragical. A great variety of plans of medication, directly opposite to each other, have been tried with equal success, which fact ought to be conclusive with every unprejudiced mind that the whole is purely empirical. Let us place a few of the opposite plans of treatment recommended to us on high authority in juxtaposition: Bleeding and antimony—opium and brandy; copious libations of cold water—powerful internal stimulants, as capsicum and cajeput oil; emetics of mustard, ipecac, antimony, and blue vitriol—iced-water, or bits of ice, to allay sickness at the stomach; cathartics, as calomel, castor-oil, colocynth, jalap, colchicum, and croton oil—astringents, as sugar of lead, lime-water, and nitric acid; hot water, fomentations, dry heat, wine, and alcohol—cold water, solutions of potash, soda water, and effervescing draughts; mustard plasters and blisters to the stomach, caustics to the spine—large doses of opium and strychnine; inhalation of oxygen gas—injections of saline

solutions into the veins; galvanism and mercuria frictions—tobacco, and the exhausted air-bath, etc., etc.

In the early stage of the disease, a free injection of tepid or rather warm water should be administered frequently; meanwhile the thirst should be assuaged, and the heat of the stomach mitigated with frequent but moderate draughts of cold water, or bits of ice, and the *cold* compress to the abdomen, well covered with dry, soft flannel. Before the surface becomes very cold, or the patient sinks into collapse, the dripping wet sheet, followed by the dry sheet, and both accompanied with active and persevering friction, should be employed; the wet-sheet pack also works admirably in the early stages. If the patient is too weak to bear these processes, and in the later or collapsed stage, the surface should be well rubbed with a cold wet towel, and this succeeded by active friction with dry soft flannel or the dry hand; the injections should then be frequently employed, but of *cool* water, and moderate in quantity. In the very outset of the disease, provided there is much nausea and retching, I would employ a brisk warm water emetic, and follow it with sips of cold water according to the degree of thirst; the cool or cold hip-bath is also a valuable assistant in any stage of the disease preceding the collapse. When the spasms are violent, the external friction should be proportionally vigorous. In bad cases, two or three stout, active attendants ought to *work* upon the patient by means of wet and dry rubbing alternately, so as to promote the superficial circulation as much as possible, and thereby relieve the internal congestion.

Cholera infantum is generally easily cured by cool injections, the abdominal compress, and the tepid towel-bath or ablution, as often as the surface manifests any considerable feverish heat. The patient may drink of pure water according to thirst. When the evacuations from the bowels are mixed with blood, the injections should be quite cold. In protracted cases, the child should be placed, once a day, when the fever is highest, in a tepid half-bath and the abdomen, back, chest, and even extremities well rubbed with the bare hand. The food must be exceedingly simple. Wheat-meal mush and rice, seasoned with a little sugar or milk, are the best articles.

Diarrhea.—The group of diseases properly arranged under this head are characterized by frequent and copious discharges by stool, with a sense of weight and uneasiness in the lower belly, and without severe griping or tenesmus; nausea and vomiting are occasional, but not usual incidents. All forms of diarrhea may become chronic, in which event there is great emaciation.

In the *feculent* variety—*diarrhea fusa*—the fœces are of common quality, but simply loose and copious.

The *bilious* variety—*diarrhea biliosa*—is only distinguished from the former by the bright yellow color of the discharges.

In the *mucous* form—*diarrhea mucosa*—the dejections consist mainly of, or contain a large quantity of mucus. This affection has sometimes been called *catarrhal diarrhea.*

The *white looseness—diarrhea alba*—is characterized by dejections of a milky color, resembling a mixture of water and lime, with a frothy scum. This has been called *chylous diarrhea* by some authors, on the mistaken supposition that the non-absorption of chyle was its immediate cause. It is chiefly found in persons whose digestive powers have been shattered by severe fevers and severer drugs, and by excessive indulgence in stimulating food or drink, or narcotic irritants, as alcohol and tobacco.

In the fourth variety—called *lientery*—the dejections consist principally of undigested aliment, which passes rapidly through the alimentary canal, with but little change.

In the *serous* variety—*diarrhea aquosa*—the discharges are almost entirely limpid and watery.

Tubular diarrhea is known by discharges consisting more or less of membrane-like tubes, or fragments of membranous tubes, which are whitish, viscous, and inodorous. This membranous secretion is of the same nature as that which takes place in the mucous surface of the trachea in cases of croup. Its expulsion from the bowels often alarms the patient, who mistakes it for a portion of the bowel itself. In some instances, membranous tubes half a yard in length have been evacuated.

Treatment.—In a general sense, the treatment of diarrhea, when protracted or chronic, is essentially the same as for dyspepsia, of which it is mostly symptomatic. The *feculent* form, being occasioned by excess in quantity, or an irritating quality of food, requires no medication save the negative remedy—fasting. *Bilious* looseness is readily relieved for the time by one or two copious tepid injections. All the other forms must be treated on general principles; the local irritation may be relieved by sitz-baths, cold injections, cold compresses, hot fomentations, etc., as either may be indicated, while the cure must be found in a restoration of the general health, for which purpose all the means recommended for the treatment of dyspepsia must be had recourse to. In all forms of chronic diarrhea the diet must be carefully attended to; it cannot well be too bland and simple and the whole regimen is, in all respects, the same as for dyspepsia.

Intestinal Concretions.—There are three kinds of stony concretions found in the stomach or intestinal canal, all of which are the result of indigestion connected with constipation. One kind, called *bezoar* or *bezoardus*, is frequently found in the stomachs of ruminating animals, especially the goat, but very rarely in the human stomach. It consists of a central nucleus of gravel, straw, glass, seeds of plants, etc., around which a vegetable matter or animal secretion is closely agglutinated, having a glossy white or a bright metallic luster. These concretions were formerly regarded as febrifuge by physicians, and worn as amulets by the superstitious.

Another kind—*intestinal calculus*—more frequently found in the human stomach, is composed of the same earthy and sandy matters as are found in the bladder in calculous affections of that viscus, and are of various sizes, from a pea to a hen's egg. The long-continued use of chalk, magnesia, etc., so generally prescribed for acidity of the stomach, is a frequent cause of these concretions; hence dyspeptics are peculiarly liable to them. Preparations of iron, particularly the carbonate, when administered medicinally, have been known to accumulate in the bowels and form concretions.

The third kind—*scybalum*—consisting of indurated mucus or oily matter mixed with hardened fœces, results from constipation, by which the excrementitious matter remains too long in the cells of the colon, or some other part of the alimentary tract. The discharges are usually in the form of hard roundish balls, from the size of a pea to that of a walnut. The substance called *ambergris*, found in the larger intestines of the cachalot, or spermaceti-whale, is supposed to consist of the hardened fœces of the whale, and to be the result of constipation; hence the more sickly the animal when harpooned, the more productive and valuable is its yield of ambergris.

It is generally difficult to recognize these affections by the symptoms, save when their character is revealed by the appearance of the concreted matters in the ejections or dejections. Usually, however, there is more or less pain or uneasiness at a particular point in the abdomen, and occasionally a hard, lumpy tumor, which either produces an external uneasiness or swelling, or may be distinctly felt on pressure by the fingers.

Treatment.—All we have to do in the way of medication is to get rid of the morbid accumulations by copious warm injections, and put the patient on plain, unconstipating, healthful fruit and farinaceous diet.

Worms.—Pathologists are not all yet agreed whether inverminations—worms, or the larvæ of insects inhabiting the stomach or intes-

tines—is natural or abnormal. It is not very long since a kind of worm-mania prevailed in the medical profession, by which a multitude of diseases were ascribed to vermination. Dysentery, plague, measles, small-pox, hydrophobia, itch, syphilis, piles, cholera, and even toothache, have been imputed to various kinds of animalculæ, vermin, or insects.

There is no manner of doubt that worms are suspected, by physicians and nurses, to occasion various ailments of children much oftener than they really exist; but it is equally true that they do occasionally effect a lodgment, and become developed in the alimentary canal, producing a variety of symptoms indicative of gastric and intestinal irritation. Their origin is not so clear. In some instances it is quite obvious that the young or ova of some species of worms is taken into the stomach with the ingesta; generally when drinking of stagnant or marshy waters, or when eating decayed or infected fruits and vegetables, or partially decomposed and putrescent animal food. It is also highly probable, at least, that the minute eggs, or ovula, of various animalculæ floating in the atmosphere, and collecting, especially in damp places, on the alimentary materials, get an entrance into the digestive cavity, and, providing they find in foul secretions, retained excrementitious matters, or impurities of any kind, a proper nest, quicken into life, grow, and become finally so strong and vigorous as to resist the ordinary solvent property of the vital fluids, and the expulsive efforts of the unaided *vis medicatrix naturæ*. This idea makes the existence of worms depend on a morbid condition, which I believe to be the fact; for I have never yet known any kind of vermin to trouble children who have been fed and reared healthfully. Dr. S. Cooper and many other medical writers of credit assert that worms are most prevalent among the poor, dirty, ill-fed classes of society, and particularly in persons who reside in damp, marshy countries.

Alvine worms are those which exist and find a proper nidus in the stomach or alvine canal; they are mostly found in children and sickly adults, producing emaciation, a swelled, hard belly, gnawing or pungent pain in the stomach, pale countenance, fetid breath, and irritation of the nostrils. These worms have been arranged into five varieties, viz., the *long round-worm*, *long thread-worm*, *long tape-worm*, *broad tape-worm*, and *fluke*. The first and second varieties are much more common than the others. The latter is rarely found in man, though the most common to domestic animals.

Anal worms exist in or near the rectum or lower bowel. They excite a troublesome itching or irritation of the part, often preventing sleep, and sometimes occasioning pain or faintness in the stomach

The varieties found in this locality are the *ascarides*, called also *thread-worm*, and *maw-worm*, the *beetle-grubs*, and the *bots*. The first variety is most common, and is somewhat migratory, being occasionally found in the stomach and bladder. The last two kinds are very rare in the human animal.

The *erratic* worms, which are occasionally though not frequently found in the alimentary canal, are the *hair-worm*, the *erratic leech*, and the *maggot*. These are called erratic, because they do not find a proper habitation in the stomach or intestines; they produce spasmodic colic, with severe gripings; and sometimes vomiting, or dejection of blood. The first and second varieties are chiefly found where the stagnant, muddy, and putrid waters of marshes, pools, and ditches is drank. They sometimes, when accidentally introduced into the human stomach, attain an enormous size, and deviate so much from their ordinary shape as to be with difficulty recognized. Dr. Good says *(Study of Medicine)*: "It is highly probable, however, that they can only live in dyspeptic patients, or persons whose digestive powers are infirm; for there are few or no animals capable of resisting the solvent power of the gastric juice when secreted in full health and vigor." The third variety find their way into the stomach in the condition of eggs or *hoppers*, which are deposited in various articles of food, particularly in all strong and stale meats, cheese, bacon, etc.

Diagnosis.—Dr. Heberden has most clearly presented the general train of symptoms which determine the existence of worms: "Headache, vertigo, torpor, disturbed dreams, sleep broken off by fright, screaming fits, convulsions, feverishness, thirst, pallid hue, bad taste in the mouth, offensive breath, cough, difficult breathing, itching of the nostrils, pains in the stomach, nausea, squeamishness, voracity, leanness, tenesmus, itchings at the anus toward night, at length dejection of films and mucus. The broad tape-worms produce the severest mischiefs on the body; the teretes and ascarides (round and thread-worms) sometimes lurk scarcely suspected, unless there is itching of the anus, or they are traced in the fœces." All of these symptoms, however, *may* arise from any continued irritation in the first passages; hence, in forming our diagnosis, we must take the greater number of the above symptoms in connection with the *absence* of any other recognizable malady to which they can reasonably be attributed. "In all obscure diseases," says Swediaur, "attended with symptoms that are chiefly anomalous, the suspicions of the physician should be directed to intestinal worms."

Treatment.—It is obvious that the radical cure of worms must depend upon removing the morbid condition which renders the aliment-

ary canal their habitable abode; this implies a restoration of vigorous functional actions, and pure secretions; and to effect this we must again resort to all the medication suited to dyspepsia. Some extra management, however, is necessary to dislodge the intruders from their slimy beds, and loosen their hold upon the mucous membrane. This can be best accomplished by copious injections of cold water occasionally, and rigidly simple and unconcentrated food. A perfect "vermifuge" diet may be found in two articles—the crusts of good, sweet wheat-meal bread, and good, ripe, uncooked apples. It is important that most of the food be hard, so that it be well masticated, and that it be eaten slowly, so that the stomach be not overloaded. Dry toasted brown bread is also admissible; and cracked wheat may be used moderately by way of variety. All slop food is especially objectionable Those mothers who have pampered their little ones on fine sweet-cake until it has produced worms, may find it somewhat difficult to restrict them to the coarse bread which will cure them. Still, they *can* do it, and *should*.

HEMORRHOIDS.—Dr. Good limits the definition of the varieties of the diseases comprehended under this generic term to "livid and painful tubercles or excrescences on the verge of the anus, usually with a discharge of mucus or blood." This definition excludes those swellings of the veins near the anus and within the rectum, which are termed *hemorrhoidal varices*, and which almost all persons who are habitually costive are more or less troubled with, evinced by pain and difficulty in passing the fœces, which are slightly streaked with blood. Dr. S. Cooper, and, indeed, nearly all medical authors, regard the various forms as originally mere swellings of the veins.

Description.—In their simplest state piles consist of varicose tumors of the anal veins, covered with a slight thickening of the mucous membrane of the rectum. They are first noticed in the form of small fleshy tubercles, generally of a brownish or pale red color and either situated within the anus, or descending from the rectum. They have rather a solid and spongy feel, and when quite external are pale, and more elastic and transparent; they frequently appear and disappear very rapidly. Piles often contain a central cavity, filled with fluid or coagulated blood; and by repeated attacks of inflammation the swellings gradually enlarge into caruncular excrescences about the verge of the anus, either within or without, of various shapes and forms, from pea-sized to fig-sized, and are frequently so painful as to prevent either sitting or walking. When these caruncles are hard, florid incompressible, without discharge, and intolerably sore to the touch, the

affection is called *blind* piles. When the irritation accompanying them induces a discharge of whitish mucus from the neighboring glands, it is called *white* piles. When the hemorrhoidal vessels, which form or support the growing tumors, are so distended as to burst and bleed freely, it is denominated *bleeding* piles. And when warty excrescences spread about the perinæum, or within the verge of the anus, it is called *caruncular* piles. Usually pile tumors become larger and firmer with every reappearance; and when they have been strangulated for some time by the pressure of the sphincter, repeatedly gorged with fluids, or of very long standing, they become fixed and permanent in size, and acquire a greater degree of solidity; they are then a source of almost constant pain and trouble from protrusion, inflammation, or ulceration, and often occasion a most distressing prolapsus of the lower bowel.

Special Causes.—Among the causes assigned in medical books, we find "local irritation produced by indurated and retained fœces; purgative stimulants, especially aloetic purgatives." This may all be resolved into constipation, and the medicine given to cure constipation. Probably more than half the adult population of the United States are sufferers, to a greater or less extent, from piles in some form. For eight or ten years past, during which time my attention has been especially called to this subject, I have found a great majority of invalids who have applied for water-treatment, whatever might have been the character of their leading malady, to be also afflicted with this. Its special and almost exclusive cause is concentrated food, inducing constipated bowels; but it is almost always greatly aggravated by the purgatives which have been given, by regular and irregular quacks, on account of the constipation. Most of the patent pills, from which newspapers derive so large a revenue, and the people so many shattered constitutions, are strongly aloetic, and hence peculiarly calculated to inflame and relax the vessels of the rectum, already irritated and engorged by their hardened contents. Many frightful cases of external protrusion, or falling down of the anus, have come under my observation in the persons of habitual pill-takers. In some cases the bowel has prolapsed three and four inches.

Dr. Good names "peculiarity of constitution" as one of the causes of pile tumors; and Dr. Copland *(author of a Medical Dictionary)* "conceives that piles are most common in persons who possess a very strong action of the sphincter ani, and are hence habitually predisposed to a spasmodic stricture of the rectum." These remarks, from these eminent authors, I consider eminently nonsensical. Nothing but the false philosophy of a false system could ever induce such erudite

and critical scholars to perpetrate such absurdities. According to my experience, nine out of every ten of relaxed, debilitated females, who must of necessity possess a *very weak* instead of very strong action of the sphincter, as well as of all the other muscles, are affected with pile tumors.

Treatment.—Piles may be promptly relieved by local appliances; but the cure depends on restoring the integrity of the digestive functions. The general management is essentially the same as for dyspepsia. When the tumors are inflamed and painful, very frequent sitz-baths, of a low temperature, 60° to 50°, with oft-repeated injections of a small quantity of cold water, should be employed, until relief is obtained; after which about four to six ounces of very cold water should be thrown into the rectum every morning previous to the expected action of the bowels. When the bowel is prolapsed, the patient should keep the horizontal position mostly, and apply the coldest wet cloths to the fundament. Sometimes an excessively irritable or highly inflammatory condition of hemorrhoidal tumors, occasions a severe and protracted diarrhea, the discharges occurring as often as once an hour, or every half hour, consisting mainly of small quantities of bloody mucus, or slimy matter tinged with blood, and accompanied with considerable tenesmus, griping, or bearing down sensation. Such attacks usually last a week, and not unfrequently two or three weeks; the patient generally, and the doctor sometimes, mistake the case for dysentery. Here injections do but little service; the wet-sheet pack, two or three times a day, and the wet abdominal bandage very frequently changed, are our most advantageous resources.

The dietary part of the management is of first importance. In some few cases the mucous surface of the lower bowel is so tender and irritable, that almost all food seems to act as a mechanical irritant; the patient, however, at such times needs but very little of any kind, and this may be boiled rice, farina, Graham flour mush, tapioca, etc. But generally the unbolted and unconcentrated forms of farinaceous food are preferable, as in all other forms of indigestion.

Hard warty excrescences around the anus, or scattered over the perinæum, may be removed with entire safety and facility by the ligature, or knife, or clipped off with a pair of scissors. Removal by excision and by ligature has often been practiced in the other kinds of hemorrhoidal tumors, but there is always danger to be apprehended from hemorrhage in the one case, and from sympathetic inflammation in the other; moreover, if all the resources of hydropathy and hygiene are judiciously drawn upon, there is not the least necessity for these surgical operations.

CHAPTER V.

FLUXES.

I ADOPT this generic term, not because it is clearly appropriate or distinctive, but because it is familiar. The only species strictly pertaining to this genus are catarrh and dysentery, both essentially febrile diseases, and each consisting of a peculiar inflammation of some portion of the general mucus membrane; each exhibits two varieties, thus:

Catarrh { Common, Epidemic. Dysentery { Acute, Chronic.

CATARRH.—This is an inflammatory affection of the mucous membrane of the fauces, often extending to the frontal sinuses or bronchia, or both; it is attended with sneezing, obstruction of the nostril, and more or less mucous expectoration, or discharge from the nose.

Symptoms.—In *common catarrh—cold in the head or chest*—the fever is slight; there is a sense of weight over the eyes, and fullness in the head, and the nostrils pour forth a thick, acrimonious ichor, which excoriates the skin; the voice is hoarse, and more or less cough attends. In the *epidemic* form—*influenza*—the attack is sudden, and the fever severe and strikingly depressive; there is great heaviness over the eyes, extreme languor, anxiety, and oppression at the præcordia, with frequent sighing, sickness, and violent headache. The pulse is very frequent, and peculiarly irregular; the skin is moist, with a tendency to profuse sweating, but the heat of the body is seldom considerable; the tongue is white or yellowish, but moist; sometimes there are severe general or local muscular pains, and at other times erysipelatous patches appear in different parts of the body. The danger of this disease is not in proportion to the violence of the symptoms, as compared with all other febrile diseases, for usually the symptoms are extremely violent for one or two days, and then as rapidly subside; great debility, however, frequently exists for weeks or months after convalescence is established. Often severe pains attack the chest, and in such cases physicians, regarding them as indicative of pleurisy, have endangered the patient's life by venesection.

Special Causes.—Common catarrh is usually traceable to taking cold. Influenza, like Asiatic cholera, is usually epidemic, and has prevailed at all seasons of the year, in every state of the barometer, thermometer, and hydrometer. Dr. Good very cautiously imputes its

specific cause to *some* "atmospheric intemperament;" Dr. Weber has suspected "negative electricity" of the mischief; but none of the modern theories are any improvement on that of Hippocrates, which was "providential interposition;" nor the very modest suggestion of Sydenham, who was *rather disposed* to ascribe it to "*some* occult and inexplicable changes wrought in the bowels of the earth itself, by which the atmosphere becomes contaminated with *certain* effluvia which predisposes the bodies of men to *some* form or *other* of disease." Influenza is the most widely-spreading epidemic known, having sometimes extended over all Europe and a part of America in the same season.

Treatment.—This is exceedingly simple. Practically, common catarrh may be regarded as a *high fever*, and influenza as a *low fever*. In the former affection, the wet-sheet pack is specially indicated as the leading measure, repeated according to the general feverishness; and in the latter, the tepid ablution, frequently repeated, and followed by the dry-blanket envelop when the body feels chilly after the bath, with the chest-wrapper, well covered when the lungs are troublesomely affected, and warm hip and foot-baths when the abdominal viscera are disproportionately disturbed. Generally the bowels require to be moved by free tepid injections at the outset; and when there is considerable nausea and retching, the warm water emetic should be administered. The general regimen is the same as for simple fever.

Dysentery.—This disease was called *bloody flux* by the old authors. It is an inflammatory affection of the mucous coat of the larger intestines, accompanied with griping and tenesmus; the dejections are frequent and bloody, and the fœces are discharged irregularly.

Symptoms.—In the *acute* variety, the abdomen is painful or tender, the fœces are discharged with difficulty; mucous and bloody dejections alternate, or are variously diversified in color and consistence; the attending febrile disturbance is considerable, and may be of the *high* or *low* character—the synochus or typhoid type.

What is called *chronic dysentery* is sometimes a milder and more disguised form of the disease, but more generally it is common diarrhœa modified by local circumstances, or a sequel of maltreated acute dysentery. In plainer English, it is frequently a drug-disease. This remark need not excite surprise when the formidable array of drug-poisons which modern medical science has brought to bear upon this disease, and upon the patients' constitutions, too—calomel, corrosive sublimate, sugar of lead, antimony, nitrate of silver, opium, capsicum, oil of turpentine, mineral acids, etc.—is taken into account. Chronic dysentery

is attended with but slight fever, and that usually of the hectic type. Either variety may be attended with ulceration of the bowels, and purulent, sanious, or membranous evacuations, or discharges of pure, unmixed blood.

Special Causes.—Dietetic errors of all kinds are the principal predisposing, and undue exposure to cold, damp, sudden alternations of temperature, etc., the chief exciting causes. Bad water and marsh effluvia sometimes occasion the worst forms of the disease.

Treatment.—Medical books are as discordant in relation to the treatment of dysentery, as they are in the case of cholera. In treating the disease hydropathically we must ever keep in view the character or type of the fever, which is in reality as much a part of the disease as is the local inflammation of the colon, or other large intestines. When the general fever is violent, the wet-sheet pack or half-bath should be employed, according to the degree of heat. Moderate draughts of cold water should be frequently administered, and the whole abdomen constantly covered with the wet compress, which should be very often changed, until the pain, heat, tension, etc., subside. In the early stage one or two copious tepid injections are advisable, to clear the alimentary canal of its irritating crudities, after which moderate cool injections are to be employed occasionally. Sometimes very cold or iced water has a more soothing effect upon the griping and tenesmus than any other temperature, and reference should always be had to the patient's feelings in regulating the temperature of the water.

Hip-baths, the temperature low in the ratio that the general fever or heat of the abdomen is high, may be advantageously employed once in two or three hours. I have seldom found any difficulty in curing this complaint in children, in a very few days, by two or three daily tepid washings of the whole surface, the constant application of the wet compress to the abdomen whenever and as long as the heat was above the natural standard, the free use of cool or cold water as a drink, and one or two tepid injections at the outset. The diet should be: entire abstinence until the violence of the fever and local inflammation are both sensibly abated, and then as bland as possible—boiled rice, rice gruel, wheat-meal mush or gruel, toasted brown bread, etc. When ulceration takes place in the intestines, and the discharges exhibit pus, putrid sanies, or black, grumous, fetid blood and slime, the diet may be with propriety restricted, for a week or two, to rice or arrow-root.

I have never known relapses, or "sequelæ," which are so common and so formidable after an attack of this disease and a course of drug-treatment, occur in a patient who was treated hydropathically from first to last.

CHAPTER VI.

CACHEXIES.

LITERALLY, the term cachexia means bad habit of body, a condition which exists more or less in all diseases. But there is a class of diseases pre-eminently distinguished as being caused by or attended with universal depravity of the organization, or general derangement of all the bodily functions, constituting, in fact, a constitutional taint or malconformation, which may be transmitted through many generations, with either increasing or decreasing intensity, as the voluntary habits of each successive generation are more or less in conformity with physiological laws; and this group of diseases may be appropriately considered in the present chapter, as expressed in a tabular arrangement:

Consumption	Tubercular, Catarrhal, Apostematous, Laryngeal, Hemorrhagic, Dyspeptic.	Hemorrhage	Epistaxis, Hæmoptysis, Hæmatamesis, Hæmaturia, Uterine, Anal.
Marasmus	Atrophy, Anhæmia, Climacteric, Tabes.	Scurvy	Simple Scurvy, Land Scurvy, Sea Scurvy.
Elephantiasis	Arabian Italian, Asturian.	Plethora	Sanguine, Serous.
		Scrofula,	Melanosis,
		Cancer,	Catacausis.

Most of the above diseases, and several which I have thought proper to consider under other heads, are included in the order *dysthetica*, in Dr. Good's nosology, a term which signifies "an ill-conditioned habit."

CONSUMPTION—PULMONARY CONSUMPTION—PHTHISIS PULMONALIS.—Consumption of the lungs is the most general evidence and the most fatal result of the artificial and enervating habits of civilized society. In the city of New York, about 2000 die annually of this disease and in Boston, Philadelphia Baltimore, and a majority of the

other cities of the United States, the mortality from this source bears nearly the same relation to the population. In most other countries in which civilization has made equal progress, the disease has committed equal ravages. Dr. Young has calculated that it destroys, prematurely, one fourth of the inhabitants of Europe. Females, from their more sedentary, indoor, and relaxing habits, are rather more liable to this malady than males. The period of life between puberty and middle age—fourteen to forty—is more especially favorable to the operation of the causes of this disease, and the greatest ratio of mortality occurs between the ages of thirty and forty. The greatest number of deaths, in this latitude, takes place in the coldest months of the year. This fact, however, does not prove that the cold season is more conducive to the development or causation of consumption, but that consumptives are more liable to sink at that particular period.

Symptoms.—Tubercular consumption is by far the most frequent and most intractable form; and, indeed, some authors regard the existence of tubercles in the lungs as essential to the character of true phthisis. It is usually connected with a strongly-marked scrofulous diathesis, is more insidious in its approach, and more delusive in its progress than either of the other varieties. Many persons are born with such a malformation of the chest, and so great a predisposition to tubercles, that the slightest aberrations in the manner of life suffice to induce that condition of engorgement, mal-assimilation, and morbid deposition which eventuates in general tuberculation of the pulmonary structures. The special symptoms are, short and tickling cough; the pain in the chest is slight; there is either a sense of tenderness or weight experienced at the upper part of the lungs; the breathing is habitually short, and a full inspiration is impracticable, the attempt increasing the sense of weight, soreness, or aggravating the cough; the expectoration is generally scanty and small in quantity in the early stages, and in many cases it is very trifling throughout; the matter expectorated is a watery, whey-like sanies, sometimes tinged with blood, and as the disease progresses, thick, tenacious, curdy, or cheesy particles are excreted. Sometimes small, irregular stony concretions are formed by the deposition of earthy matters—mainly carbonate of lime—in the substance of the tubercles, and expectorated as the process of ulceration releases them from their inclosures. Emaciation does not become strikingly apparent until the disease has made severe inroads upon the constitution, and not unfrequently the body maintains its ordinary fullness until the greater portion of the lungs is fatally occupied by tubercular formations. In those cases attended with but trifling expectoration, there is, of course, but little ulceration; yet generally some por

tions of the tubercles are ulcerating, and forming open, irregular cavities in the substance of the lungs, while in other parts of the pulmonary structures, the process of tuberculation is going on. As the functional powers of the lungs become impaired, the pulse becomes frequent and feeble, the breathing grows shorter, irregular chills come on, succeeded by some degree of feverish heat; and in the last stages, night sweats, diarrhea, swellings of the limbs, etc., denote the rapidly approaching fatal termination. In this form of consumption, the hope of recovery often attends the patient almost to the dying hour, and schemes of business or pleasure, or new projects for recovery, occupy his thoughts until within a few days or hours of death.

There has been much controversy among medical theorists whether tubercles are the product of inflammatory action, or of irritative action, or of an action to which some other technical term should be applied. The discussion is entirely unprofitable. It is enough to know that the general condition of the body is one of debility; that the local condition of the part diseased is one of engorgement, and its secretions changed from a healthy to a morbid character. It is also a disputed point whether tubercles in the lungs are curable in any case, some eminent authors taking the position of their absolute and unconditional fatality. while others, equally respectable as practitioners and pathologists, contend that cures have resulted in a few instances.

Dr. Good, in allusion to a remark of Dr. Woolcombe, that 55,000 victims annually die of consumption in Great Britain, makes the following very singular observation: "During the last half-century, it is said to have been considerably on the increase; but this is perhaps chiefly owing to the greater number of infants of delicate health who are saved from an early grave by the introduction of a better system of nursing than was formerly practiced, yet who only escape from a disease of infant life to fall before one of adolescence or adult years. And, for the same reason, savages rarely suffer from consumption, as they only rear a healthy race, and lose the sickly soon after birth." I think a better explanation can be found in another way. Much of the increasing mortality is justly attributable, in my opinion, to the introduction of a *worse* system of nursing infants than formerly prevailed, to wit: close rooms, hot slops, tight clothing, nick-nack food, apothecary drugs, etc., by which the bodies of the infants become sickly, stunted, feeble, and susceptible before they emerge from their cradles. The reason that the savages seldom have consumption is because they are comparatively exempt from the peculiar debilitating customs of our "better system." The statement that they lose all their sickly children is wholly gratuitous.

In the *catarrhal* form the cough is frequent and violent, with a copious expectoration of a thin muco-purulent matter, rather mixed with blood, but generally offensive to the smell. There is considerable soreness of the chest, and transient pains shifting from side to side It comes on after repeated colds, or a protracted catarrhal affection.

The *apostematous* variety is known by a dry cough, which returns fitfully; fixed, circumscribed, obtuse pain in the chest, which is sometimes throbbing or pulsatory; the patient experiences great difficulty in lying on one side. The cough at length terminates in a sudden and copious expectoration of purulent matter, which sometimes threatens suffocation. These symptoms are immediately owing to the formation of an aposteme or abscess in the lungs. When the collection of matter is considerable, the patient often experiences severe rigors or chills, and manifests a high degree of irritative fever. After the discharge of the matter, the patient is sometimes permanently relieved; but usually the relief is temporary, and all the symptoms recur repeatedly at longer or shorter intervals, as new abscesses form and discharge their contents. In some few instances no expectoration takes place, the patient dying before the abscess breaks.

Laryngeal phthisis is that modification of the disease in which ulceration commences in the larynx before any extensive morbid alterations have occurred in the lungs. It is distinguished by excessive irritation and tickling in the larynx, with a cough dry and husky at first, but soon attended with a slight discharge of purulent mucus, frequently streaked with blood; there is also remarkable hoarseness, which occasionally goes and returns without any assignable cause, and a sense of soreness or tenderness about the upper part of the throat; often there is some degree of actual hemorrhage from the diseased part.

All these symptoms may occur in the last stage, or near the fatal termination of either of the other forms of consumption, more especially the tubercular; and also in the worst cases of bronchitis; they can, therefore, only be properly regarded as a distinct variety of phthisis when they take the lead in the morbid manifestations. When the ulceration of the larynx, instead of preceding disorganization in the lungs, comes on after ulceration in the lungs has long existed, the patient complains more particularly of a sore, oppressive sensation in the throat, as if some foreign mass were lodged in the larynx; and this sensation is generally accompanied by more or less difficulty of swallowing; it is, too, usually accompanied with a peculiar hoarseness, or, rather, roughness in the voice. In most cases it is a fatal omen, occurring only a few days, or at most a few weeks, before death.

The *hemorrhagic* variety is characterized by repeated attacks of

hæmoptysis, or bleeding at the lungs. The coughing or expectoration of a large quantity of blood, may indeed be, and usually is, an accidental occurrence in all the other forms of the disease, especially the tubercular and the dyspeptic varieties; nevertheless, it sometimes takes place without evidences of any considerable organic change either in the lungs or digestive organs, and recurs with such frequency and violence as to exhaust the patient, producing all the train of constitutional symptoms which marks the progress of the other varieties of consumption. It is intimately connected with the next variety—dyspeptic phthisis—and usually depends immediately on an excessively engorged condition and relaxation of the pulmonary vessels, this condition being chiefly owing to a shriveled, bloodless state of the superficial capillaries, or to an enlarged liver, or, which is more common still, to both of these circumstances combined.

Dyspeptic phthisis is that form of pulmonary consumption which is preceded by protracted disease of the digestive organs; the lungs are affected sympathetically, or, rather, the morbid condition is extended from the abdominal viscera to the lungs; the liver being usually the organ most concerned in the primary malady. This variety of consumption is more common than is generally supposed, constituting, in fact, a majority of the cases we meet with. It is seldom correctly diagnosticated, from the fact that, when the lungs become prominently the seat of the morbid phenomena, the prior evidences of digestive derangement, or disease of the liver, are overlooked; very often the latter are so obscure as to be wholly disregarded, unless the physician discovers their relation to the affected lungs by a carefu investigation of the history of the patient, from the first appearance of ill-health. Dr. Wilson Phillip says that drunkards, whose digestive powers have been broken down by ardent spirits, frequently fall a sacrifice to this disease; and he regards those who have suffered severe attacks of dyspepsia, and what are called bilious complaints, as peculiarly liable to dyspeptic consumption.

Diagnosis.—As it is only in the incipient stage of all forms of consumption that we can have any reasonable assurance of effecting a radical cure, it becomes exceedingly important to detect the malady before it has made irremediable advances. It is impossible to give a list of symptoms which may be relied upon as pathognomonic. Whenever the patient experiences habitual cough, be it ever so slight, and habitual expectoration, of whatever character, with shortness of breath, a sense of pain, fullness, weight, or uneasiness in the chest, with an increasing feeling of general languor or debility, the case is *probably* consumption, and should thenceforth receive the closest scrutiny. If

these symptoms have been preceded by dyspeptic indications, or evidences of disordered or torpid liver, the danger is greater; and if the constitution is manifestly scrofulous, still greater apprehension may be entertained. In the early stage of the dyspeptic variety, the cough and expectoration occur chiefly in the morning, and are hardly noticed during the remainder of the day; the expectoration consists of a small quantity of tenacious mucus or muco-purulent matter, generally discolored in the morning by a carbonaceous, dark-colored stain, as though charcoal dust had been diffused through it.

The early symptoms in all forms of consumption are obscure and insidious; and those which attend its progress and mark its several stages are subject to very great diversity. But the general progress of the symptoms may be enumerated as follows: The patient first becomes sensible of unusual languor, and breathes with less than usual freedom; his respirations are shorter in duration and more frequent in number. He coughs occasionally, but does not complain of its being troublesome, and he very rarely expectorates when coughing. Some degree of pain, soreness, weight, or uneasiness, will be at this time experienced in some part of the chest whenever the patient makes a deep and prolonged inspiration. As these symptoms increase, the pulse becomes more frequent and weaker, particularly in the after part of the day. After the disease has made a little further progress, there is feverish feeling or hectic flush toward evening, a tendency to undue perspiration during the night, and either the sleep is disturbed by fits of coughing during the night, or a considerable paroxysm of coughing takes place early in the morning, leaving the patient with a greater feeling of feebleness and relaxation. This assemblage of symptoms may be considered as constituting the first stage.

In what may be regarded as the second stage, in which the disease is evidently established and generally hopeless, the cough increases in frequency, and, from being dry, is accompanied with a purulent mucus, varying from a watery whey-like matter occasionally tinged with blood, to an expectoration of genuine pus, which may be variously colored—livid, deep black, light brown, light green, bright or dark yellow, hard and lumpy, or soft and shredy, flattened or round, fetid or odorless. In many cases of the tubercular form it is very scanty, while in a majority of the catarrhal it is extremely copious. The uneasiness in the chest is now felt more constantly, and the sense of weight has become permanent; hectic fever is fully developed, and the breathing is often accompanied by a sound somewhat like the ticking of a watch. The strength fails rapidly, the body emaciates, the pulse beats more frequently and feebly, generally ranging from 100 to 130; yet in some

instances of the dyspeptic variety I have known the pulse to preserve the slow, languid motion characteristic of that form of digestive derangement in which torpor of the liver is a prominent condition, until the last. The teeth usually increase in transparency, and the eye manifests an unnatural brilliancy, the sclerotic coat becoming of a pearly white. The fingers are shrunk, except at the joints, which become prominent; the nails are bent for want of support; the nose is sharp; the eyes sunken; the countenance wears a peculiar but mortal smile; the whole body is shriveled; the spine projects, instead of sinking, from the decay of the muscles; and the shoulder-blades stand out like the wings of birds.

The third stage is attended with diarrhea, apthous or ulcerated throat, difficulty of swallowing, dropsical swellings in different parts of the body, and various other symptoms indicative of the final exhaustion of the powers of life.

Although extreme emaciation usually occurs before death, yet in a few cases, particularly in the apostematous variety—which is the form most frequently designated as the *quick* or *galloping* consumption—the progress of the local inflammation is so rapid, that the extensive disorganization of the pulmonary structure produces a fatal result before the body is greatly attenuated. In a few instances recoveries have happened after extensive vomica, or abscesses, have been formed in the substance of the lungs; and a very few examples are recorded in which the patient has survived the entire destruction of one lung.

Pathological Appearances.—Dissections, which do not prove the *nature* but the *effects* of disease, show, in almost all cases, an indurated and ulcerated condition of the lungs. Tubercles are formed indiscriminately in all parts of the cellular texture of the lungs, but more frequently and abundantly at its upper and posterior parts. They exhibit every diversity of size; are generally whitish and opake, like small absorbent glands, but sometimes semi-transparent, like cartilage, with black dots in their substance. They often augment by degrees till they attain half an inch in diameter; but usually, when about as large as peas, they begin to soften in the center, and finally open by one or more small apertures into the neighboring bronchiæ, or remain for a longer time closed, and constitute small abscesses, filled with a curdy, half-formed pus. In some cases large abscesses are formed, without any trace of tubercles; in a few cases the lungs appear hardened, hepatized, or shriveled into a leathery appearance; and occasionally the whole cellular substance is occupied by tubercles, with little appearance of excavations or open ulcers.

Physiological Signs.—Much attention has, of late years, been be-

stowed upon *percussion* and *auscultation* as means for ascertaining the exact morbid conditions or structural derangements of the thoracic viscera and the *stethescope*, invented by Laennec, has come into very general use, as a convenient acoustic instrument for the purpose of determining, with greater precision, the abnormal changes which take place in the lungs. There is no doubt that, by much experience, the practitioner can, in many cases, decide with much greater accuracy as to the exact point of the lungs most diseased, and, possibly, as to the extent in which the disease has involved the lungs in disorganization, with the aid afforded by a careful stethescopic examination; yet, on the whole, I regard the instrument as of very little practical value. So far as the prospect of cure and the proper course of medication are concerned, the intelligent physician can derive no advantage from the stethescope; and even experienced practitioners are about as liable to diagnosticate erroneously with as without its assistance. I can name at least one person in the city of New York whose lungs were pronounced incurably tuberculated by an experienced professor of stethoscopy, who is now in the enjoyment of excellent health.

Special Considerations.—Consumption has been regarded as contagious by some. There is no question that all diseases have a tendency to propagate their kind—like *causes* like—yet this disease is not more chargeable with "personal communicability" than a majority of others. It may, indeed—and I have known such instances—be *acquired* by a vigorous, healthy person, who has no hereditary predisposition, by a long and intimate intercourse with, or attendance upon, a patient who has declined under it; as, for example, a husband or wife, devoting himself or herself assiduously to the care of a bosom companion through all the stages of the malady, occupying the same room, sleeping in the same bed, and personally performing all the acts of kindness and duty required by the patient's condition, may in time become similarly affected. It has been remarked by most authors that any suddenly suppressed evacuation or accustomed discharge, is peculiarly liable, especially when a predisposition exists, to induce consumption. I think, however, all the danger from this source could be obviated by a proper attention to the general health. A suppression of the menstrual secretion in females is supposed peculiarly to conduce to the formation of a consumptive diathesis; but more generally the suppression follows as a consequence of prior disease of the lungs. Pregnancy often arrests the progress of the disease, even when far advanced; but it recurs in all its force soon after the function of gestation is completed.

Treatment.—It is the common consent of the medical world that consumption is incurable, especially in all stages after the first; and

those few examples of cures recorded in medical works have confessedly recovered "spontaneously," or by "the efforts of nature," at all events, without the benefits of drug-medication. Under water-treatment some cures of apparently hopeless cases have been made; the majority, however, who have thus far sought the aid of the new system have deferred it too long, yet, although they have necessarily failed of being radically cured, they have, in nearly all instances, been greatly benefitted, while in many cases life has been extended for several years.

Practically, we are to regard the affection of the lungs as a local expression of a general disease; hence the constitutional management is of incomparably more importance than the topical. Every measure which tends to invigorate the general system, and every appliance which will conduce to a more free expansion of the lungs, and assist in relieving their congested condition by diffusing the accumulated blood over the surface, must be perseveringly employed; while, negatively, all sources of irritation and debility must be sedulously avoided. Instead of bundling up in flannels, and sitting down by a hot stove, or lounging in a warm room, the patient must dress as lightly as possible without actual discomfort; he must take as much out-door exercise as his strength will permit, and spend as much of his time in the open air—in walking, riding, sailing, etc.—as possible, without exhausting fatigue. Horseback exercise, I think, is not advisable after the disease is fairly formed, the other kinds being altogether preferable. High mountainous regions are certainly preferable to low lands for consumptives, the air being not only more dense but more pure. A residence inland, and a voyage at sea, are both preferable to a residence on the sea-shore, in a case of confirmed consumption, for the reason that there is less uniformity of climate and temperature in the latter locality than in either of the other situations. A removal to warmer and more equable climates—Florida, Cuba, Madeira, etc.—is not necessary to the cure of the malady. In some cases, however, it seems to stay its progress, while in others the change hurries it on rapidly to a fatal termination. Medical authors wholly fail to account for these diverse results. The explanation is probably this: Of those who go to the South, or to more genial latitudes, some are affected with primary disease of the liver and digestive organs, the lungs being secondarily or sympathetically diseased; while in others the lungs were the organs primarily affected with local disease. The former will decline with greatly accelerated speed on going to a much warmer latitude, but the latter will generally experience a temporary alleviation of symptoms.

A great variety of muscular or gymnastic exercises can be employed to advantage in expanding the chest. Striking the elbows or backs of

the hands together behind the back; making gentle circular motions with the hands while both arms are extended laterally from the body; striking the hands out laterally alternately, etc., are useful methods. The body must always be kept in the erect posture whether exercising or at rest, sleeping or waking. One of the very best respiratory exercises is that of taking slow, deep, full inspirations, holding the breath as long as convenient when the lungs are fully inflated, and then expiring very slowly; this may be practiced a few minutes at a time, and repeated many times a day. Silver tubes have been constructed to assist the consumptive in expanding the lungs in this way, and in many cases very great benefit has been derived from them; still they are no better than a common goose-quill, nor have either any advantage over the practice of respiring through the nose in the same slow, regular manner. Let it be remembered, that in all kinds of exercises care must be taken not to greatly disturb the breathing or accelerate the pulse. Within this limitation they should be as frequent and active as possible. Dumb-bells afford a good exercise, but they must be handled gently, and not be very heavy. The play of *graces* is also excellent.

With regard to diet, no disease, not even dyspepsia, requires a more rigidly plain and abstemious course. The general plan of dieting is the same as in cases of dyspepsia. But the irritable state of the general system, coupled with the inflammatory condition of the lungs, causes the most trifling disturbance in the digestive organs to result in a much more serious injury to the lungs. I have repeatedly seen all the symptoms severely aggravated, the expectoration entirely changed for the worse in character, the cough greatly intensified, and all the advantage gained by a month's faithful treatment lost by a single injudicious meal. Consumptives labor under one disadvantage which dyspeptics do not in the matter of dieting. The latter feel whatever hurts them in the stomach, and hence in their feelings have a better guide to direct them in the choice of food, or rather in respect to what may be profitably abstained from. The former have the sensibility and irritability more concentrated upon the lungs, and frequently have no other evidence of what agrees or disagrees with the stomach than the better or worse character of the pulmonary symptoms. Experience, therefore, is, with the consumptive, a more blind guide than with the dyspeptic. Judgment must reign supreme here, and appetite and morbid sensibility obey.

For these reasons the diet may be, and, on the whole, should be, more bland, watery, and innutritious than is tolerated in the majority of cases of dyspepsia. I believe nearly every case will do better by entirely abandoning all animal food, save milk, and even this should be used as

a seasoning rather than as a substantial part of the meal. Coarse bread, wheaten grits, the mildest vegetables and best fruits, constitute the best articles of food, and a sufficient variety, as far as the question of recovery is concerned; and even this simplicity will avail nothing unless strict moderation in quantity is at all times observed. In many cases, and in all in which I have advised the experiment, the patient has been evidently advantaged by taking a very light breakfast, a moderate dinner, and no supper at all. The oppressed lungs require all the room and all the quiet possible to obtain during sleep; and a trifling load or irritation in the stomach will often produce a restless night, and a more engorged condition of the lungs.

In all cases except those attended with considerable emaciation and severe dyspeptic symptoms, rather free water-drinking is advisable; not, however, to the extent of sensibly oppressing the stomach. From five to ten tumblers can usually be taken daily to advantage.

In regulating the bathing processes, we must keep in view a threefold condition—general debility, feverish excitement, and local inflammation. Consumptives generally bear cold bathing well, but the baths should seldom be very long continued. When the superficial heat is not materially deficient, nor the hands and feet inclined to much coldness, the cold wet-sheet pack for an hour, followed by the tepid shallow bath, for five minutes; the half-bath at 72°, five to ten minutes, and the hip-bath at about 65°, fifteen minutes, with the constant employment of the chest-wrapper, constitute a plan of bathing which, with such modifications as will be suggested by individual circumstances, is adapted to the majority of cases. The walking foot-bath I have known peculiarly serviceable in several cases. The douche, of moderate force, is a useful adjunct in the early stage of the tubercular variety; and in the incipient stage of all forms, I have observed manifest relief of the local symptoms by the spray or fountain applied to the chest daily, or every other day. In the latter stages, when the patient is troubled with rigors or chills, the dry pack, during the cold stage, will usually shorten the duration of the chills, and mitigate their severity. Night sweats may be checked or palliated by the rubbing wet-sheet at bed-time, if the patient is able to bear it, if not, by sponging the surface with tepid water.

When extensive ulceration or tuberculation exists in the lungs, the patient will be extremely sensitive to cold, and the temperature of the water should be milder; care should be taken, under these circumstances, to avoid any bath which occasions much of a shock to the system.

For the benefit of such consumptives as are compelled to do the

best they can with home-treatment, it may be stated that very little bathing is absolutely essential, if the patient will attend strictly to all the other resources of hygiene. One or two sponge-baths or towel-washings daily, and one or two sitz-baths, with the employment of the chest-wrapper or abdominal girdle, as the local symptoms are more prominent in the respiratory or digestive organs, all of which processes the patient can manage with very little assistance, will answer all remedial purposes, provided the patient keeps in the open air as much as possible, takes almost constant but not violent exercises, according to his strength, and lives on the smallest quantity of coarse, bland food, which will range above starvation.

I cannot conclude this topic without a paragraph of animadversion upon the popular allopathic method of doctoring consumptives. I have known so many scores of persons *killed outright*, so many cases of incipient converted into confirmed consumption, and so many confirmed consumptives hurried out of the world, by drug-medication, that I cannot speak or write on the subject, except with language of earnest denunciation against the senseless and murderous practice of reducing and poisoning the systems of those unfortunate invalids, whose vital powers are wasting fast enough without being aided by "medical science." The ordinary treatment may be resolved, substantially, into opium, bleeding antimony, blisters, and expectorants. Each article and each process, I affirm, is individually injurious, and all are collectively pernicious. The opium lessens the effort at coughing, by which the lungs endeavor to free themselves of a morbid secretion, but aggravates the actual diseased condition of the lungs. The bleeding lessens the patient's sensibility —feeling—for a brief period, and renders him less conscious of his disease; but it is at the expense of his vitality. The antimony lessens the febrile excitement, and diminishes the force of the circulation by deadening the nervous influence, and destroying the ability of the muscular fibres to act at all. The blisters abate the pain and soreness in the lungs by paralyzing the natural sensibility, or overwhelming the lesser with a greater pain; but they render the intercostal muscles sore and sensitive, make a free expansion of the lungs more painful and more difficult, and thus tend to fasten the disease irrecoverably upon the system. Expectorants, which are given to facilitate the excretion from the bronchial ramifications, make the patient raise easy by increasing the quantity to be raised; and as the secretion of mucus, or pus, is already morbid and in excess, there can be no possible ultimate advantage in increasing it. I know very well the theories—and they are quite "too numerous to mention"—upon which such practice is advocated and defended; but they are as absurd and irrational as the

practice is unsuccessful and death-dealing. Of the lengthy catalogue of specifics which have had and still have a reputation in the medical world for curing consumption—digitalis, cod-liver oil, etc.—I need not speak. If the fact that all the patients who are *cured* by them soon go to their graves, is not a sufficient commentary, and if the forty or fifty deaths in the city of New York returned weekly to the inspector's office by the physicians under the head of consumption, do not sufficiently attest the fallacy and falsity of the popular theory and practice, as far as this malady is concerned, no explanation that I could offer would be of any avail.

MARASMUS.—A morbid condition, of which general emaciation of the body, with debility, without local inflammation or other disproportionate affection of any particular organ or viscus, has long been recognized by physicians under the generic term *marasmus*. "Leanness," says Dr. Good, "is not necessarily a disease; for many persons who are peculiarly lean are peculiarly healthy." It is only when increasing debility accompanies gradual emaciation that the extenuation of the system is to be regarded as abnormal. The proximate condition upon which all the varieties of marasmus depends, is bloodlessness. The manufacture and supply of nutrient material is not equal to the waste, and this implies a primary fault in the digestive or assimilating functions, or obstruction in the capillaries.

Symptoms.—In the first variety—*atrophy*—the complexion is pale, often squalid; skin dry and wrinkled; muscles shrunk and inelastic; the appetite is feeble or capricious; there is little or no fever. With infants or young children the above symptoms are preceded by flaccidity of the flesh, bloated prominence of the abdomen, irregularity of the bowels, and pendulousness of the lower limbs. To these symptoms succeed drowsiness and languor, chilliness in the morning, flushed cheeks, restlessness and general feverishness toward evening; the urine is scanty, the fœces dark, green, or pitchy, and highly offensive; the skin is hot, dry, and extremely irritable, and the child is constantly picking the nose, lips, corners of the eyes, fingers, and anus. This form of marasmus has been variously termed, in medical books: *infantile remittent fever*, *gastric remittent*, *infantile hectic*, *worm fever*, *mesenteric fever*, *stomach fever*, *low fever of children*, etc.

In the second variety—*anhæmia*, *anæmia*, *exsanguinity*—the whole surface, and particularly the face and lips, are ghastly pale; pulse frequent and feeble; dejections from the bowels irregular, black, and fetid; appetite greatly impaired; emaciation and debility extreme.

The third variety—*climacteric*—has been called, very incorrectly

decay of nature. The term adopted is derived from the Greek physiologists, who divided the period of life into five epochs or climaxes, at each of which they supposed the body was peculiarly liable to some remarkable and sudden alteration for better or worse. It is characterized by general decline of bulk and strength, with occasional renovation, subsequent to the middle period of life, without any manifest local disease.

The fourth variety—*tabes*—has been known by the simple appellation, *decline;* it is distinguished from atrophy by the presence of hectic fever. It appears at any age of life, and is also characterized by the accompaniment of depressed spirits. It is the consequence of some lurking poison in the system, generally of a scrofulous or syphilitic character, or of excess or intemperance in the exercise of the animal propensities, or indulgence of the passions When occurring from undue indulgence in libidinous pleasures, it has been called *tabes dorsalis*, from the great weakness which is experienced in the back and loins. The habit of self-pollution often induces this malady in boys and girls, and sometimes even before the age of puberty.

Special Causes.—Scarcity of food; improper aliment, as baker's sweet-cake, and distillery milk; profuse evacuations; scrofulous, scorbutic, or syphilitic taint; mineral drugs, as mercury, antimony, nitre, and potash; acrid narcotics and debilitating sedatives, as opium, alcohol, tobacco, digitalis, iodine, hydriodate of potassa; antiphlogistic medicines, as salts, vinegar, colchicum; irritant drugs, as aloes, preparations of iron, nitrate of silver, arsenic; cold, damp, and impure air, as found in low basements, dark cellars, subterranean tenements, rear buildings; depressing mental influences, as the loss of friends, or reverses of fortune; violent passions; venereal excesses.

Treatment.—In every case of genuine marasmus, the grand morbid condition is deficient circulation in the capillary system. Whether the nutritive functions are abnormally torpid, or the excretory organs preternaturally active, or whether the functions of supply and waste are both morbidly affected, the single indication of cure is the same—to augment capillary circulation. Of course, all the causes which are operating to produce or continue the malady are to be sought out and removed or counteracted, and all the resources of hygiene are to be applied to the general invigoration of all the organic functions; but the bathing appliances are few and simple. The dripping wet-sheet or towel-wash, and the half or shallow-bath daily, followed by as much friction or rubbing over the dry sheet as the patient can well bear, are the best water-processes, and in most cases all that are necessary. The temperature is a matter of considerable importance. It should be at

cold as is consistent with prompt reaction; the proper rule, as in all cases of feeble circulation, is to begin with water of a comfortable temperature, say about 80°, and very gradually reduce it as the patient becomes accustomed to the impressions. For very feeble patients one bath daily may be sufficient to commence with; and such should take frequent exercise in the open air, by riding in a carriage if unable to walk. With regard to water-drinking and diet, the rules often heretofore intimated are to be observed. In most cases the strict or dry diet is the most desirable.

The allopathic treatment consists mainly of stimulating food, as flesh-meat, soups, broths, etc., and irritating drugs, particularly the different preparations of iron; and although almost every author of that school coincides in this plan of treatment as the only one to be relied upon, yet almost every case on record so treated resulted in death! The form of this disease called *anhæmia* has lately attracted considerable attention in the medical profession because of its frequent occurrence in women soon after childbirth. One of the allopathic journals, a few months ago, related the particulars of six cases, all of which went down to death rapidly under the "tonic" and "supporting" system of iron and wine; and concluded the sad story of mortality with an "able argument" in favor of the same treatment as the only hope of the patient!

ELEPHANTIASIS.—This affection, called in English *elephant skin*, consists of a thick, livid, rugose, tuberculated, and insensible state of the skin. It is attended with great debility, and a variety of morbid symptoms, the sum total of which evince a general depravation of all the fluids of the body. Among the most prominent of these are remarked, highly offensive perspiration, and fierce, staring eyes.

The first variety—*Arabian—black leprosy*—is hereditary in Arabia and India, and is in those countries regarded as contagious. It is also known in the high northern latitudes of Norway, and is very prevalent in Iceland. The tubercles are chiefly confined to the face and joints; the voice is hoarse and nasal; the hair, except on the head, falls off; the nose is swelled and scabrous; the lips tumid; the nostrils preternaturally dilated; the lobes of the ears are enlarged and thickened, and beset with tubercles; the external sensibility is so obtunded that pinching or puncturing the skin occasions no pain. At length the tubercles crack and ulcerate; ulcerations also appear in the throat and nostrils; the breath becomes intolerably fetid; the nose falls off; the palate is destroyed; the fingers and toes become gangrenous, and drop off one after another.

The *Italian* variety is found chiefly among the Milanese and Venetian peasantry, who live in wretched hovels, breathe foul air, and eat gross and unwholesome food. The disease comes on with languor, listlessness, gloom, weakness and stupor in the lower extremities, vertigo, mental confusion, etc. These symptoms, which usually occur in the spring, are followed, as the warm weather increases, with burning and itching over the whole surface, except that of the head, and these are succeeded by an eruption of rosy papulæ, scattered generally over the skin, and terminating in tubercles of a shining red color. During the summer the tubercles desquamate, and the skin finally recovers its natural color. In the winter the patient recovers some degree of strength, but the symptoms reappear with increased violence with the return of spring, and again subside on the recurrence of cold weather, and so on for several years in succession. In the end, delirium, furious mania, or stupid melancholy, diarrhea, and dropsy come on, and not unfrequently the miserable victim terminates his sufferings by the act of suicide.

The variety called *Asturian*, is the *Asturian leprosy* of Sauvages, and some other nosologists, and the *mal de la rosa* of the Spaniards. It is found among those who inhabit filthy tenements, crowded, unventilated rooms, swampy valleys, etc. It differs from the preceding variety in attacking the head as well as the other parts of the body; the tubercles are peculiarly painful, highly fetid, more deeply furrowed with cracks, and more disgusting to the sight.

Treatment.—Cleanliness, in the broadest acceptation of the word, comprises the whole remedial course. Frequent cool or tepid bathing or washing of the whole surface, copious water-drinking, and a dietary restricted to plain vegetables, fruits, and farinacea, are all the details which need occupy these pages.

Hemorrhage.—Occasional or accidental hemorrhages occur in a great variety of diseases, not connected with any general taint or depravation of the organism. But it is only when bleeding results from an impaired or partially putrescent quality of the blood itself, or from a debility and relaxation of the coats of its containing vessels, or from both of these conditions together, constituting the hemorrhagic diathesis, that the affection properly pertains to the genus before us. A flow of blood from the nose, lungs, stomach, bladder, uterus, or anus, may result from local congestion or incidental plethora—constituting the *entonic* hemorrhages of Dr. Good—and either of these conditions may depend on temporary or occasional causes; the group of diseases, therefore, included in the present genus, comprises only the *atonic*

hemorrhages of authors. When the hemorrhagic diathesis has become established, nose-bleeding is most common during the periods of youth and of senescence; bleeding from the lungs occurs most frequently between the ages of fifteen and thirty-five; and in more advanced life the tendency is to more frequent hemorrhages from the abdominal and pelvic organs.

In the first variety—*epistaxis—nose-bleeding*—the quantity of blood lost is, in some instances, enormous. Examples are recorded of its continuance for several days, and even weeks, of the quantity of blood discharged amounting to ten, twenty, and even forty pounds.

In the second variety—*hæmoptysis—spitting of blood—bleeding from the lungs*—it is often difficult to determine from whence the blood issues; whether from the fauces, posterior cavities of the nostrils, the lungs, or the stomach. In hæmoptysis the blood is thrown up chiefly by coughing; the blood is of a florid, arterial hue; there is a sense of tickling about the fauces; moreover, it is usually preceded by flushed cheeks, more or less pain in the chest, with some degree of dyspnœa. Sometimes, however, there are no precursive symptoms, and the blood is rather hawked or spit up intermixed more or less with saliva, and is of a darker color; but in this case an irritative cough ensues, and the blood is mingled with a frothy mucus. When the spitting of blood is from the cavities of the nostrils, it will cease on lying procumbent, or bending the head forward, and will then probably flow from the nose. When it proceeds from the fauces, the fact can generally be ascertained by ocular inspection.

In *hæmatemesis—vomiting of blood—bleeding from the stomach*—the blood is of a dark color, is thrown up by vomiting, and is usually intermixed with food; the discharge is preceded by tensive pain about the stomach, and accompanied with anxiety and faintness. In some cases the blood is discharged from the bowels at the same time.

In *hæmaturia—bloody urine*—the hemorrhage is from the bladder or kidneys, and the blood is discharged at the urethra, sometimes intermixed with urine. The evacuation is preceded by pain in the pelvic region, and accompanied with faintness.

Uterine hemorrhage is called *menorrhagia* in most medical books, and described as an excess of the menstrual discharge. This is a mistake. It is not a profuse catamenial secretion, but an actual bleeding from the uterine vessels. In fact, it is always attended with a real deficiency of the menstrual flux. It sometimes occurs in young girls from habits of self-abuse; and is very liable to attack unhealthy females on the final cessation of the menses, and occasionally attacks females far advanced in life.

In *anal* hemorrhage the blood flows principally from the hemorrhoidal vessels; it is preceded by a sense of pain and weight in the rectum; and, when the patient is of rather full habit, by headache or vertigo.

Special Causes.—The ordinary exciting causes of disease, operating upon an exhausted or depraved organism, in which relaxation of the muscular coats of the capillary vessels in a prominent condition, may excite either form of hemorrhage we have considered, as the predisposition exists, more particularly in the organ or part which is the seat of it. All these varieties of hemorrhage are, however, very frequently the result of external violence, or symptomatic of other local affections, in which case the treatment is to be mainly directed to the primary malady. Thus epistaxis may be the result of exposure to the direct rays of the sun, sudden and severe cold in the head, violent coughing or sneezing, and various emotions of the mind; hæmoptysis occurs sometimes from an enlarged liver pressing against the lungs, suppressed perspiration, straining of the respiratory muscles, excess in eating and drinking, suppression of customary discharges, etc. Hæmatemesis is often the consequence of shocks, contusions, vomiting, pregnancy combined with constipation, violent passions, schirrus, or cancer of the stomach, etc. Hæmaturia results frequently from a blow or a fall, gravel, stone in the bladder, ulceration, severe inflammation, and the use of some kinds of irritant drugs, as cantharides. Uterine hemorrhage is occasionally caused by polypi in the womb, or other structural derangements; and anal hemorrhage is a very common symptom of hemorrhoidal tumors, or piles.

Treatment.—The indications are—to excite contraction in the bleeding vessels, balance the circulation, and invigorate the general system. Locally the coldest water, or pounded ice, may be employed, until the flow of blood is checked. For nose-bleeding, a cold stream or iced water may be applied to the back of the neck, and cold water frequently sniffed up the nostrils, at the same time the head should be freely exposed to the cool or cold air, and the bleeding part be kept entirely uncovered. In bleedings from the lungs and stomach, sips of the coldest water, or even bits of ice, may be occasionally swallowed, while the coldest compresses are applied over the stomach and chest. In bleedings from the urethra and rectum, cold injections and cold hip-baths are the local appliances. In all cases the patient must keep quiet, and avoid any source of bodily or mental excitement; and if there is feverish heat or inflammatory excitement, the whole body must be promptly cooled with the dripping-sheet or ablution. When the extremities are preternaturally cold, rubbing them thoroughly, first

with cold wet cloths and then with dry flannel, is advisable. To accomplish the third indication, we must pursue the appropriate management for the restoration of general health.

SCURVY.—Dr. Good defines the general symptoms of the scurvy—*scorbutus*—"livid spots on the skin from extravasated blood; languor, and loss of muscular strength pains in the limbs."

The first variety, *simple* or *petechial* scurvy, is almost always a sequel of protracted and debilitating fevers, especially of the putrid type. Rarely, however, it occurs in persons of a gross and full habit, who are not regardful of hygiene in their personal habits. It is characterized by numerous small spots resembling flea-bites, chiefly on the breast, arms, and legs; the visage is also pale.

In the *hemorrhagic* variety—*land scurvy*—the spots are circular, of a purple hue, and of different sizes; sometimes in stripes or patches irregularly scattered over the arms, trunk, and thighs; occasionally there is hemorrhage from the mouth, nostrils, or viscera; and there is great debility and depression of spirits. In severe cases the patient has the bloodless, exhausted appearance observed in anhæmia; and blood flows irregularly and often profusely from the lungs, stomach, intestines, and uterus, as well as from the mouth and nostrils.

In the *nautical* variety—*sea scurvy*—the spots are of different hues intermixed with livid, principally at the roots of the hairs; the teeth are loose; the gums are spongy and bleeding; the breath is very fetid, and the debility is extreme. The joints soon become weak, and there is often a shrinking of the flexor muscles, rendering the limbs useless, and constituting what has been called *scorbutic paralysis*. The spots often coalesce in large blotches, or form ulcers, which discharge a thin, fetid, sanious fluid, mixed with blood; and in the last stage blood is discharged from the viscera as in the former variety.

Special Causes.—Stale food, salted provisions, an exclusive flesh-meat diet, and vitiated air, are the ordinary producing causes; they are almost always associated with inattention to personal cleanliness. Either one of these causes alone may produce a modified form of scurvy, but all operating together generate the most aggravated cases.

Treatment.—The proximate condition upon which this disease depends is a putrescent state of the blood. The indication of cure is, therefore, simply, to purify the blood; and a moderate course of general bathing, with a liberal supply of fresh vegetable and farinaceous food, and plenty of good ripe fruit, will answer the indication. On account of the extreme laxity and debility, the tepid half-bath, and dripping-sheet, or towel-wash, are the preferable water appliances. Small

quantities of very cold water should be frequently taken into the stomach, and when the disposition to hemorrhage is great, cold water enema should be occasionally employed. Brown bread, wheaten grits, mealy potatoes, and good apples, are the best *antiscorbutics* known.

PLETHORA.—The condition of the body to which nosologists have applied this term, is that of general engorgement or over-fullness; it is the result of excessive alimentation, or defective depuration, or both Full-feeding and inactivity are the producing causes.

The *sanguine*, or *entonic* variety, is distinguished by florid skin, full strong pulse, turgid veins, with firm and vigorous muscular fibres; and the *serous*, or *atonic*, is denoted by a full but frequent and feeble pulse, smooth and soft skin, plump but inexpressive figure, and general languor or debility of the vital functions

Treatment.—The remedial measure of first importance is active outdoor exercise. This may be commenced gently, and gradually increased; but it should always be to the utmost extent of the patient's capacity to endure, short of excessive fatigue. It is of little consequence what the kind of exercise is, if it is sufficient in constancy and degree. The next matter requiring attention is the food; this must be plain and coarse in quality, and in quantity no more than actual nutrition demands A moderate course of the "starvation regimen" for a few weeks would accelerate the process of throwing off the superfluity, hardening the structures, and invigorating the general system. Lastly, the whole surface of the body should have one or two daily washings in cold water, followed by thorough friction with a coarse towel or the flesh brush.

SCROFULA—STRUMA—STRUMA VULGARIS—SCORBUTUS—KING'S EVIL.—The term scrofula—derived from *scrofus*, a sow—literally imports *swine-swellings*, *swine-evil*, or morbid tumors to which swine are subject. Scrofula has long been recognized as a disease common among swine, and it is doubtful if any of the domesticated swine are exempt from it. It is well known that all hogs fattened in the ordinary method are extensively diseased, and a source of disease to those who eat them. In this country the general employment of this filthy animal as food, is the cause of many morbid affections, manifested under a great variety of scrofulous, erysipelatous, putrid, glandular, and skin diseases.

The Scrofulous Diathesis.—A scrofulous constitution means simply, a frail, delicate, infirm, lax organization, a habit of body possessing a predisposition to the affection called scrofula, and peculiarly liable to develop glandular swellings chronic ulcerations, tubercular formations, and vis

ceral enlargements, whenever the exciting causes of disease are applied with ordinary intensity. The predisposition, however, under favorable hygienic influences, may lay dormant through life, and only be called into activity in the succeeding generation. The scrofulous constitution is said to be characterized by relaxed fibres, smooth and soft skin, fair and fine hair, a peculiar fullness and rosy appearance of the face, full upper lip, tumid alæ nasi, large eyes, long silky eyelashes, delicate complexion, large head, precocious brain, great sprightliness with feeble endurance. But it must be remembered that this description applies only to extreme cases, or an inherited diathesis. The most usual pathological indications of the scrofulous habit are, strumous ophthalmia, chronic inflammation and suppuration of the glands of the neck, porriginous affections of the scalp, enlarged tonsils, rickets, spinal diseases, tabes mesenterica, white swellings, inflammation of the membranes of the brain, and tubercular consumption.

Symptoms.—The most common form of the disease—that form known as scrofula proper—appears in indolent glandular tumors, frequently in the lymphatics of the neck, but also often affecting the external or internal conglobate glands, suppurating slowly and imperfectly, and healing with difficulty. In size these tumors usually range from that of a pea to that of a chestnut, but occasionally they are much larger. In some instances, scrofulous tumors appear in clusters about the neck, and armpit, and upon the breast. Usually the tumors which appear in infancy subside at the period of maturity. Scrofulous inflammation frequently attacks the external structures of the eye, the spongy, and sometimes the cylindrical bones, and the ligaments, cartilages, and membranes around the joints.

Special Causes.—Whatever deteriorates the general health tends to bring the scrofulous predisposition into a state of activity. Various forms of scrofulous disease frequently follow severe febrile and obstinate cutaneous affections, as measles, small-pox, scarlatina, yaws, syphilis, etc., and are then usually ranked among the sequelæ of those diseases. I think they are much oftener a result of the drug-medication. All mineral drugs, and particularly mercury and antimony, which are so freely prescribed in all the above diseases, have a powerful influence in exciting inflammatory action and tubercular depositions in scrofulous constitutions. Narcotic medicines, as opium, tobacco, alcohol, etc., are also efficient exciting causes. The depressing antiphlogistics—vegetable, earthy, or saline—as digitalis, senna, potassa, nitre, epsom salts, etc., and all debilitating processes, as bleeding, leeching, cauterization, profuse evacuations, etc., tend to produce a scrofulous diathesis where it did not previously exist, and aggravate it when already existent. The

scrofulous diathesis may therefore be either inherited or ingenerated. A combination of bad food, impure water, foul air, dark tenements, sedentary occupation, and poisonous drugs, is sufficient to produce the scrofulous diathesis independent of any hereditary taint.

Treatment.—The disease before us being one of debility and obstruction, invigoration and purification constitute the indications of cure. And first among the restorative resources of hygiene are abundance of pure fresh air, and plenty of clear sunlight. Sunshine itself is better than all the tonics of the allopathist's materia medica. The food must be restricted to the best fruits, vegetables, and farinaceous preparations, but allowed in liberal abundance. For city children good country milk is essential. The distillery slop-milk, on which so many thousands of our infantile population are daily fed, is a fruitful and frightful source of scrofulous affections, as well as other fatal diseases. Scrofulous patients should, as a general rule, drink water rather freely, especially in the fore part of the day. Generally one or two full baths—tepid, cool, or cold, according to the debility or inflammatory action existing—daily are sufficient. Wet compresses should be constantly applied to the tumors so long as they manifest preternatural heat, redness, or pain; and the wet-sheet pack, followed by the dripping-sheet or half-bath, should be employed daily whenever the whole body is feverish, and once or twice a week during the whole course of treatment; a moderate douche may be occasionally applied along the spine to advantage; and when the body evinces symptoms of general obstruction, torpor, over-fullness, and turgescence, moderate sweating in the dry blanket will be serviceable. Critical boils, eruptions, and abscesses are very common under active treatment.

CANCER—CARCINUS—CARCINOMA.—The Greek word, carcinus, means a crab; and the disease is thus named from the crab-like ramifications of the dark distended veins of the cancerous tumor. Any part of the body may become the seat of this affection, although secernent glands are most frequently attacked. The breasts of females, uterus, testes, glans, penis, tongue, stomach, cheeks, lips, and angles of the mouth, are its chief localities. The cancerous diathesis, like the scrofulous, may be either inherited or acquired, and, notwithstanding many nosologists have regarded this disease as a purely local one, the majority now assent to the doctrine that the topical affection depends on a peculiar constitutional distemper, taint, or malassimilation.

Symptoms.—A cancer commences with a hard, livid, knotty tumor, with dark, cancriform varices, intersected with firm, whitish, divergent

bands; it is attended with acute, burning, lancinating pains, and terminates in a fetid, ichorous ulcer, having thick, livid, distorted lips.

In the breast, the first appearance of the disease is a small indolent tumor, which is attended with an itching feeling; this is followed, after a longer or shorter time, by a pricking sensation, and this is succeeded by a shooting or lancinating pain eventually a sense of burning is experienced and the skin becomes livid and discolored. Adhesive bands are formed in the skin, which becomes puckered, and the nipple is drawn inward, sometimes entirely disappearing; the tumor ere long becomes more elevated, and feels knotty to the finger; at length the ulcerative process appears by the integument giving way at different points, through which an ichorous, erosive fluid, sometimes tinged with blood, is thrown forth; as the ulcerative action advances, a broad, deep excavation is made, which discharges a most offensive and fetid matter.

Cancer of the uterus is known by darting pains in the part, shooting through the region of the pelvis, and usually indurations in the part, which are sensible to the touch; a preceding and immoderate menstrual or leucorrheal discharge, or both; and as soon as ulceration occurs there is a sanious, bloody, or mixed discharge, characterized by the peculiar stench of the disease.

In the vagina and rectum the disease can be ascertained by the touch, in connection with the other symptoms; in the mouth, and on various parts of the external surface it is obvious to the sight.

In the stomach it is with difficulty diagnosticated. An acute and burning pain, tenderness of the epigastrium on pressure, nausea, rejection of food, offensive fetor in the breath, are together strongly presumptive, though not absolutely pathognomonic, of the disease.

Special Causes.—"Of the remote causes of cancer," says Dr. Good, "we know nothing." Other authors confess the same ignorance of the proximate cause, and of the nature of the cancerous diathesis. The most common of the exciting causes are, external injuries, as blows, depressing passions, spirituous liquors, narcotic medicines, gross, high-seasoned food, etc. That our friends, the allopathists, regard the disease as in some way or other dependent on or connected with a specific virus, is evident from the remedies which are put most prominently forward in their books. These are, arsenic, henbane, and nightshade—the first, a powerfully corrosive poison, and the last two, deadly narcotics. The utter confusion which reigns in the brains of medical book-makers concerning the real nature, causes, and proper medication of cancer, is evident enough from the following paragraph in relation to its treatment, found in Copland's Medical Dictionary. After enumerating two or three hundred *internal remedies*, all of which

have enjoyed a high reputation, but which cannot *now* be depended on, comprising, in fact, nearly all the strong, pungent, powerful, and poisonous drugs and chemicals of the apothecary shop, our author remarks:

"Of the numerous *external remedies* recommended at various periods, the preparations of arsenic and quicksilver, charcoal and carrot poultices; the mineral acids, particularly chlorine, hydro-chloric, and chloric acids; the chlorurets, and *many* of the metallic salts; camphor, the balsams, and the terebinthinate substances; ammoniacum, galbanum, and myrrh; and the *greater part* of the astringent, antiseptic, detergent, and stimulating vegetable medicines, have obtained a greater degree of reputation; and when *some of them are judiciously combined with one another, and with narcotics*, they are *deserving of notice* as discutients in the early stage of the disease, and as palliatives in its ulcerating state."

Treatment.—The constitutional treatment for cancer is essentially the same as for scrofula; and all that has been recommended for scrofula, in the matter of diet and regimen, is applicable here, with this exception—cancer requires even a more rigidly simple and a very abstemious diet. In this disease the "hunger-cure" is an indispensable auxiliary, or rather, perhaps, the leading remedial measure. Several cases are on record of foul, fungous, and cancerous tumors, which had resisted caustics and the knife, being cured by a simple and strict dietary. The celebrated Dr. Twitchell, of New Hampshire, was cured, a few years ago, of a malignant tumor of the lip, which had been extirpated once, and repeatedly cauterized in vain, by restricting himself to a diet of bread and cream, the quantity being barely sufficient for necessary nutrition. Brown bread, parched corn, or other grain, with a moderate allowance of good fruit, and plenty of soft water for drink, constitute a dietary it would be difficult to improve upon. In all diseases connected with general depravity of the secretions, and in all cases where a strict diet is advisable, a good proportion of the food should be hard or solid, for the double purpose of insuring complete mastication and better guarding against excess in quantity. Medical authors of the old school are generally opposed to "low diet," in this disease; but with them low diet means slop food, and high, or "generous" diet implies stimulating or animal food. I am opposed to both of these plans, not only in this disease, but in all others.

Every measure which can in the least conduce to the general invigoration of the system, must be unremittingly employed. Abundance of fresh and pure out-door air is indispensable, and, as in scrofula, one, two, or three general baths may be employed daily. There is but little to choose between the different kinds of baths; the dripping

sheet, half-bath, or plunge, as either is most agreeable to the patient's feelings. It is generally, however, important to deterge the skin thoroughly, and keep up a good degree of activity in the cutaneous excretory process, by occasional packings in the wet sheet, so managed as to produce moderate but not debilitating sweating; or, in very torpid invalids, the dry-packing, followed by the dripping-sheet, with very active friction, may be substituted.

The local treatment is a matter of more difficulty. Extirpation will generally succeed, if resorted to in the early stages, provided the general health has been judiciously cared for; but it unfortunately happens that the operation is not often resolved upon until structural disorganization has proceeded too far to render it available. There is no doubt that, in some cases in which the local affection is much more prominent than the constitutional, caustics, or rather, perhaps, chemical antidotes, have been successful. The matter of a cancerous growth, being an abnormal formation, can, without doubt, be acted upon and destroyed, and the peculiar action or secretion on which its existence depends arrested, by substances which will not act very injuriously on the healthy structures, nor materially interfere with the normal functions; but as yet we are ignorant of any such specifics or antidotes. The "cancer quacks," it is well known, use arsenic as the principal corrosive to eat away the diseased structures; but death often results from the absorption of the poison. Iodide of potassium, and nitrate of silver are reported, on good authority, to have, in a few instances, destroyed the cancerous ulcer, which did not subsequently reappear. Some vegetable powders, as bloodroot and blue cohosh, have had a similar reputation. It is certain, however, that all these preparations fail in a majority of cases, and an anti-cancerous remedy is yet a desideratum, if indeed it is a possibility. My friend and former patient, Dr. Schell, late of New Orleans, assures me that he is in possession of an antidotal preparation which operates destructively on the diseased parts, and correctively on the morbid action, without sensibly injuring the sound structures As he is about to put the matter to a practical test on an extensive scale in this city, I need not dwell longer on the subject in this place, save to remark that Dr. S. is not one of the numerous professionable adventurers who are swarming in all our great cities, but a scientific, candid, nd honorable physician. It is due, however, to him and to the subject to say, that he depends as much on constitutional as on local treatment, deeming the latter useless without attention to the general health, this attention to be in all respects strictly hydropathic.

I have not yet had an opportunity of testing *refrigeration*, or the

application of extreme cold to a cancerous tumor; but, judging theoretically, I should expect much benefit from it. It is always advantageous to keep the diseased part covered with wet compresses of as cold temperature as can be borne without increased pain; and I cannot help believing that actually freezing the part occasionally, by the application of refrigerating mixtures, is among our most promising topical appliances.

Melanosis.—The disease called *melanose*, or *black cancer*, consists in the formation of a morbid product of secretion, of a dark color, more or less inspissated, and staining or studding the organ or structure affected. Every part of the body is liable to these discolorations or tubercles, and sometimes all the structures are loaded with them. In the areolar texture the melanotic matter often accumulates in the cells, and forms tumors of various sizes.

Symptoms.—The color of melanosis varies from a dark yellow to brown, deep blue, approaching to black, and to complete black, which is the most common. The secretion is easily detected by its peculiar shades of color in any part or organ containing it, as the surrounding tissues are lighter colored, and form a remarkable contrast with it; it is usually of a pultaceous consistence, the tubercles pea-sized to walnut-sized, and scattered in groups; they are sometimes situated upon the surface, but more generally below it; an irritative fever, mostly of the hectic form, attends, and the patient experiences great debility. The secretion is nearly destitute of smell and taste; and as no vessels or nerves have ever been in it, the matter appears to be an unorganized deposit.

Prognosis.—Dr. Good remarks: "The cause, progress, and diagnosis, are at present obscure and unsatisfactory, and the treatment is yet to be learned." The majority of cases have thus far, under allopathic treatment, terminated fatally.

Treatment.—This need not detain us. The cure depends on restoring the normal condition of the secernent system, and this presupposes the employment of all the means for invigorating the general system and purifying the circulating fluids, which have been detailed under preceding heads, more especially when treating of scurvy, scrofula, and cancer.

Catacausis.—This is a condition of general combustibility of the body, produced by the use of alcoholic drinks. Examples of spontaneous combustion as having occurred in persons long accustomed to the immoderate employment of spirituous liquors, are too well authen-

ticated to be longer doubted. The condition of body liable to this strange phenomenon may properly be called the *alcoholic diathesis*. In a majority of cases recorded, females advanced in life were the subjects of the malady. In some cases the self-consuming flame has arisen without any obvious exciting cause; but in others, a fire, a lighted candle, the heat of a stove, or an electric spark, has ignited the inebriate body. It is a remarkable fact that the flame which decomposes and reduces every fragment of the bodily structure to ashes, does not essentially injure the common furniture or bedding with which it comes in contact; and more marvelous still is the statement that water, instead of quenching the fire, seems rather to quicken it. As this is the only morbid condition known which renders the human body combustible, and the only morbid fire which hydropathy cannot extinguish, the subject need not be further prosecuted, save to point the obvious moral for the benefit of whom it may concern—that all spirit-drinkers burn, and mar, and disorganize their structures in an exact ratio to the amount of alcohol they consume, even if the alcohol does not consume them by a spontaneous, ingenerated fire in return.

CHAPTER VII.

DISEASES OF THE EYE.

The morbid conditions of the visual organ requiring attention in this place may be arranged as in the following table:

- Ophthalmia
  - Acute,
  - Chronic,
  - Purulent,
  - Infantile,
  - Granulated.
- Structural Derangements affecting the Sight
  - Nebulæ,
  - Ulcers,
  - Pterygium,
  - Staphyloma,
  - Closed Pupil,
  - Cataract,
  - Amaurosis,
  - Strabismus.
- Structural Affections of the Eyelids
  - Psorophthalmia,
  - Trichiasis,
  - Entropium,
  - Ectropium,
  - Hordeolum,
  - Excrescences,
  - Ptosis,
  - Fistula Lachrymalis
- Perverted States of Vision
  - Asthenopia,
  - Hemeralopia,
  - Nyctalopia,
  - Myopia,
  - Presbyopia.
- Injuries and Accidents
  - Ecchymosis,
  - Extraneous Substances,
  - Burst Eye.

The most common morbid affection of the eye is inflammation. It

may attack any of its structures, but is most frequently seen in the membrane covering the external coat constituting the *ophthalmia proper*, or *ophthalmitis* of authors. *Sclerotitis*, *iritis*, *retinitis*, etc., designate, in technical Latin, inflammatory states of the sclerotic, iris, retina, etc. As they should all be treated precisely in the same manner as acute or chronic ophthalmia, as the violence or mildness of their symptoms approximates the character of either, they need not be separately considered.

Acute Ophthalmia.—This is the common form of active inflammation. It commences with a pricking sensation, as though dust was in the eye, soon followed by heat, redness, swelling, and extreme intolerance to light. Often there is severe headache, with more or less general fever.

Treatment.—Keep the eye shaded from strong light, but not confined from the air by close bandaging. Apply linen cloths wet in cold water, changing them very frequently, until the temperature becomes natural, and the redness disappears. Wet the head often in cold water. If there are irregular chills and heat, employ the wet pack sheet once or twice daily for an hour, followed by the cold ablution. Move the bowels freely with tepid water injections. If the feet are cold, use warm foot-baths. The patient should eat nothing stronger than water-gruel, and but little of that, until the violence of the disease has very materially abated.

Chronic Ophthalmia.—This condition of sore eyes often results from riotous living, bad air, bad food, liquor, tobacco, etc., and is very often a sequel of maltreated acute ophthalmia. Millions of eyes are rendered miserable to look upon, or from, by the drugifications of doctoring, washes, lotions, leeching, blistering, bleeding, calomelizing, etc., to cure the acute form.

Treatment.—Particular attention must be paid to the general health. A daily rubbing-sheet, and a daily hip-bath, should be part of the treatment. Walking foot-baths are excellent auxiliaries. The eyes should be bathed several times a day in moderately tepid water at first, and finally as cold as may be found consistent with comfortable sensations after the application.

Purulent Ophthalmia—Egyptian Ophthalmia.—This form of inflammation is rapidly destructive, and requires prompt and energetic treatment. In addition to the pain, heat, and redness of acute ophthalmia, it is characterized by the enormous swelling of the eyelids,

soon followed by the discharge of a large quantity of thick, yellowish or greenish matter.

Treatment.—If there be much general heat of body, the wet-sheet packing should be employed two or three times a day, followed by washing the surface in tepid water. If the body incline to chilliness, the sheet should be wrung out of warm water. The eyes are to be very frequently washed with pure soft water, warm at first, then tepid, and then cold—never very cold. Attend to the bowels as above.

Infantile Ophthalmia—Purulent Infantile Ophthalmia.—Children of a few days or weeks old are often attacked with this formidable malady. The symptoms, however, usually come on with less violence, and progress less rapidly. But the common lotions and potions, washes and swashes, are very apt to aggravate the disorder, deform the eyelids, or destroy the sight. The treatment is the same as in the case of the adult, substituting the warm or tepid bath for the pack

Granulated Ophthalmia—Granular Eyelids.—In this affection the conjunctival membrane, or white of the eye, is raised into little projections, presenting a rough, irregular appearance. It is a consequence of long-continued or maltreated inflammation. If not cured, it may in time occasion opacities of the cornea, by the irritation it causes, followed by blindness. The only chance of cure hydropathically is by a persevering course of general and local treatment. Moderate bathing, say a daily rub-sheet and douche, the local application several times a day of very cold or iced water, or even pounded ice, with a strictly abstemious regimen, carefully avoiding all exciting condiments, and all sorts of stimulants, constitute the outlines of the remedial plan.

Nebulæ and Specks, or Opacities of the Cornea.—Nebulæ are superficial deposits in the transparent part of the eye, giving it a cloudy appearance; opacities are deeper seated, producing a dense and pearly appearance. They are caused by inflammation. Their treatment should be managed precisely as for granular eyelids, with the addition of means to excite powerful absorption. A strong douche and walking foot-baths are the best measures for this particular indication.

Ulcers of the Cornea.—These occasionally result from long-standing inflammation, and are also sometimes produced by mechanical and chemical irritants. The treatment is, in all respects, as the preceding.

PTERYGIUM.—A small reddish triangular tumor, growing from the inner cornea of the eye, or from some portion of the eyelid. It can be readily removed by cutting, the operation being entirely painless.

STAPHYLOMA.—A pearly, conical, whitish tumor, formed by the enlarged cornea projecting between the lids. It is the consequence of severe ophthalmia, and of badly-managed eruptive fevers, as the small-pox. It can only be removed by a surgical extirpation; though a rigidly abstemious and hygienic regimen might, in many instances, prevent the disease from proceeding to a dangerous extent. The sight is always destroyed.

CLOSED PUPIL.—Inflammation of the iris is sometimes followed by an obliteration of the pupil. Vision is often partially restored by forming an artificial pupil.

CATARACT.—This is an opacity of the crystalline lens or its capsule. Its progress is very slow, and it generally commences without any apparent cause. The first symptom of the approaching disease is indistinct vision. Objects seem enveloped in a mist before the eyes. A speck can then be observed in the center and behind the pupil. As the opacity increases, the sight grows dim, and vision is better in a moderate than a strong light.

Treatment.—Surgeons have three operations for its cure. 1st. Breaking up the crystalline lens with needles, which is probably the best. 2d. Depressing or pushing the lens aside from the angle of vision. 3d. Extracting the lens.

When this affection is first discovered, its further progress may be arrested, and possibly a cure effected, by the management applicable to nebulæ, specks, etc.

AMAUROSIS—DROP SERENE.—A total or partial loss of vision from paralysis of the optic nerve, or an affection of the nervous structure of the retina. It is produced by inflammation, severe exposure to intense light, intemperance, gluttony, tobacco, alcoholic liquors, excessive night labor, etc. Milton was a notable example of this affection. The defect of vision comes on gradually; letters and other objects at first look misty or confounded, or run into each other; sometimes objects seem double, and at other times portions of objects are undistinguishable. Between the objects and the eye, numerous insects, cobwebs, or other substances seem to be interposed. The eye itself manifests little or no change to the observer. Sometimes flashes of light appear

before the eyes, and the head is often affected with vertigo, pain, and heaviness.

Treatment.—Confirmed amaurosis is incurable. If taken in its incipient stage, it may be arrested and generally cured. Being essentially a disease of exhaustion, the full hydropathic system should be thoroughly and perseveringly applied. The general or constitutional treatment is mainly to be relied on, the local applications being of secondary importance. The simple and single indication is, to invigorate the whole system. The rubbing wet sheet, the pack followed by the shallow-bath or plunge, sitz, and foot baths, with occasional douches, should be adapted discriminatingly to the particular condition of each case. Every part of a hygienic regimen is important. In no disease is strict temperance in eating and drinking more indispensable. A little of the "hunger cure" would be serviceable in all of these chronic maladies of the eyes.

Strabismus.—Squinting, or cross-eyes, is sometimes congenital, and sometimes produced by diseases and accidents. Measles, dropsy in the head, worms, looking too much at objects obliquely, are exciting causes. More generally it results from a permanent contraction of a particular muscle which holds the eye in a wrong direction. It is curable, by dividing the obnoxious muscle, an operation scarcely painful or dangerous

Psorophthalmia.—A form of chronic inflammation of the eyelids, attended with itching, redness, watery discharge during the day, and a sticky, glutinous secretion during sleep. Its causes and treatment are the same as of chronic ophthalmia.

Trichiasis.—Irritative soreness of the eye, from the eyelashes growing in toward the ball. Extract the inverted hairs, and bathe often in cool water.

Entropium.—The eyelid is sometimes inverted, or turned inward It requires surgical treatment, viz., the careful excision of the inverted edge of the lid.

Ectropium.—An eversion or turning outward of the eyelid. It creates a hideous deformity, and the lid must be excised as for entropium.

Hordeolum.—Commonly known as *stye*. It consists of a small inflammatory tumor near the edge of the eyelid. It is very painful, but generally suppurates and heals in a few days. Frequent bathing of the

affected part with water of a temperature most agreeable to the feelings, lessens the pain and accelerates the cure.

Excrescenses.—Wart-like and other trifling tumors sometimes form about the eyelids; they are easily and safely clipped off with the knife or a pair of scissors.

Ptosis.—A hanging down of the eyelid over the eyeball, from relaxation or paralysis of the muscle, whose action elevates the lid. Frequent cold bathing, occasiona head-baths, gentle manipulations over the eye with the bare hand, and attention to the general health, are all proper, and generally all are necessary.

Fistula Lachrymalis.—This is a stoppage of the tear passage, caused by obstruction from a thickening of its lining membrane. The tears, instead of passing off by the nose, run over the cheek, giving the eye a watery appearance, especially when exposed to wind or cold. In protracted cases a swelling occurs at the inner angle of the eye, sometimes forming matter. It requires to be treated on the same general plan as ptosis. Usually the general health is so disordered as to render a rigidly abstemious diet advantageous. In bad cases it may be necessary to probe the obstructed canal, or wear an artificial tube.

Asthenopia.—Weak vision. This depends on constitutional or local debility, and requires the full invigorating plan before mentioned.

Hemeralopia.—Day-blindness. A peculiar sensibility of the retina, by which the patient sees better in the evening than in clear daylight. The Albino manifests more or less of this condition. It is irremediable.

Nyctalopia.—This is the reverse of the former condition, the subject having natural vision in the daytime, but very imperfect in the evening, or twilight. Glasses sometimes assist this night-blindness to some extent.

Myopia.—Short-sightedness. The subject cannot read ordinary print well beyond the distance of fifteen or sixteen inches. In looking at distant objects, he half closes the eyelids. It is most common in young persons. The oculists remedy this defect by concave glasses. Manipulations have been found successful as the difficulty depends on too great *convexity* of the globe of the eye Flattening the eyeball by

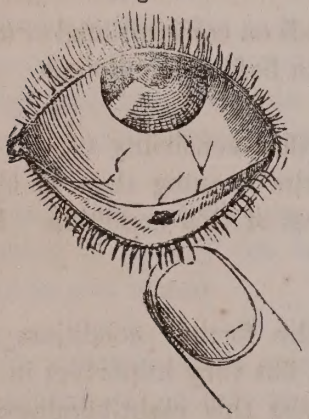
pressing gently with the fingers across it, from within outwardly, tends to restore the proper focal point of vision.

PRESBYOPIA.—Far-sightedness. The subjects of this complaint read with the book or paper at the distance of two feet or more. The corner is too flat, the pupil is contracted, and the eyes have a more sunken appearance. It is most common to aged persons. *Convex* glasses are prescribed by the oculists. The defect may be finally overcome in many persons by manipulating from without toward the nose, so as to increase the roundness of the eyeball. Press the fingers gently from the outer angle of the eye inward, and rather around than across the globe.

ECCHYMOSIS.—"Rowdy's coat of arms." This is the common black eye of rowdy characters. Generally it comes from an unlucky blow, but a fall, sting of an insect, or leech bite, may produce it. Bathe freely in the coldest water.

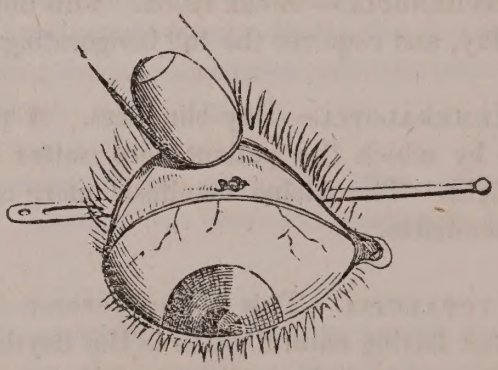
SUBSTANCES IN THE EYE.—Foreign bodies often insinuate themselves between the eyelids, causing great pain. Draw down the lower lid (fig. 183), and remove by a piece of moistened paper. If the substance be under the upper lid, place a bodkin across the lid, and draw

Fig. 183.



DEPRESSING THE LOWER LID

Fig. 184.



INVERTING THE UPPER LID.

back the lid so that it is completely inverted (fig. 184). Very minute pieces of iron are often driven with such violence that a surgeon is compelled to cut them out; but the operation should not be attempted by other parties, as they may destroy the eye. Inflammation is very apt to occur after these accidents, for which the eye should be well bathed with tepid or warm water frequently, until the pain abates; then follow with cool, and finally cold applications.

Lime and Roman cement are very destructive to the eyes. Wash repeatedly with a mixture of a table-spoonful of some vegetable acid in a tumbler of water, as vinegar or lemon juice.

Burst Eye.—From severe blows the eye is sometimes burst. Do not attempt to touch it, as vision may be irremediably damaged by touching it with the finger. The careful surgeon will frequently be enabled to preserve sight. Place the patient at once in bed, darken the room, and treat the subsequent inflammation with cool compresses.

CHAPTER VIII.

DISEASES OF THE EAR.

The various abnormal affections of the organ of hearing may be conveniently grouped under the general heads of *inflammation* and *deafness;* the *kinds* of the inflammatory affection constituting the varieties of the former, and the *causes* of the malady forming the varieties of the latter. This arrangement, I confess, has nothing classic or systematic to recommend it; nor will it embrace two of the diseases belonging to the chapter, which must, therefore, be placed under a third head, thus:

- Otitis
  - External Acute Inflammation,
  - Internal Acute Inflammation,
  - Chronic Inflammation.
- Deafness
  - From Cold,
  - " Hardened Ear-wax,
  - " Excrescences,
  - " Abscess,
  - " Caries,
  - " Altered Membrana Tympani,
  - " Diseases of the Eustachian Tube,
  - " Extravasation,
  - " Nervous Affections,
  - " Dumbness,
  - " Senility.
- Promiscuous
  - Earache,
  - Foreign Bodies and Insects.

Inflammatory affections of the ear have usually been distinguished by nosologists into *acute* and *chronic;* the former being termed *otitis*, the latter *otorrhœa*. Otitis has been divided into *external* and *internal* as it affects chiefly the external or internal ear; and *otorrhœa* has been regarded as *mucous* or *purulent*, according to the character of the discharge. Other distinctions have been predicated on the causes of the disease, as *scrofulous*, *syphilitic*, etc

External Acute Otitis.—Acute inflammation of the external ear commences with slight pain, or sense of heat, or intense irritation. or itching, followed by more acute and distressing pain. The pain is augmented on pressure, by the motions of the lower jaw, and generally by the contact of very cold air, or very warm fluids. Hearing is confused, and unusual noises trouble the ear, and sometimes, within three or four days, a thin fluid is discharged from the meatus, which generally soon becomes thicker and puriform. Sometimes it is greenish, fetid, and extremely acrid. When the inflammation subsides, the matter hardens into a caseous or cheesy consistence, which, unless removed, obstructs the passage, and occasions partial deafness.

Treatment.—This is plain and simple. Fasting until the inflammatory stage materially subsides; the constant application of several folds of cold wet cloths to the part; occasionally syringing the ear with cool but not very cold water; and general bathing, once, twice, or thrice a day, by means of the dripping-sheet or wet-sheet pack, comprise all the needful plan of medication.

Internal Acute Otitis.—Acute inflammation of the internal ear is attended with a distressing sense of distention, painful throbbing, and nervous disturbance, consequent on the obstruction of the Eustachian tube, and the difficulty of discharging the secreted matter externally. The pain is deep-seated; there is often a feeling as though the ear would burst, and loud, clanging, or beating noises are heard, and the ear is painfully susceptible to sound. In some cases the face is flushed, the eyes are red and watery the head delirious, and the attending fever of the typhoid character. If the disease is not speedily relieved, suppuration takes place, and the accumulated matters are discharged through an ulcerous perforation of the membrane of the drum, or into the throat by the Eustachian tube, or by a fistulous opening in the mastoid process of the temporal bone. The former is the usual termination; the second seldom occurs; and the latter result is extremely rare. Structural changes sometimes result from internal otitis. which partially or totally destroy the sense of hearing.

Treatment.—This disease should be met with prompt and vigorous treatment. In addition to the processes recommended for the preceding variety, cold water should be poured over the sides and back of the head, several times a day, and several minutes at a time, or until the preternatural heat of the head is thoroughly subdued. The wet sheet must be resorted to sufficiently to keep down the general fever; and the bowels should be kept well cleansed by tepid injections. In some cases the purulent matter becomes so inspissated that it makes its way through the opening in the membrana tympani with great difficulty, in which case its discharge may be facilitated by very frequent injections of warm water into the external meatus. Sometimes the Eustachian tube is entirely obstructed; this fact can be ascertained by causing the patient to make a forcible attempt at expiration with the mouth and nose closed; if the tube be permeable, bubbles of air, mixed with the fluid secretions, will escape at the external meatus. If the early treatment is thorough, and thoroughly hydropathic, this affection will almost always terminate by resolution, leaving none of those deplorable results which are so common, as sequelæ, after a course of allopathic management. Indeed, under the ordinary drug-treatment the disease often continues with violence from three to six weeks, and not unfrequently results in a complete disorganization of the internal ear.

Chronic Inflammation—Otorrhœa.—A prolonged discharge, or running from the ear, is frequently the consequence of acute otitis, and often one of the sequelæ of maltreated eruptive fevers, particularly small-pox, scarlet fever, and erysipelas. The *mucous* form is the most common among delicate and scrofulous children, and frequently, under the popular system of treatment, continues for years. The *purulent* variety is often connected with caries, or ulceration of the surrounding bony structure. The patient, in this case, complains of a dull pain in the ear, extending over the side of the head; of impaired hearing; and exhibits a dullness and heaviness of expression. The mastoid process is oftentimes the seat of ulceration, the external parts being then swollen and œdematous.

Treatment.—All forms of chronic abscesses, ulcerations, mucous or purulent discharges from the ear, should be treated on one and the same general plan. They always indicate depravity of fluids, or debility of functions, or both; hence the uniform indication is to cleanse, or strengthen, or both. First of all, the general health must be attended to. The coarse, plain, farinaceous, and frugivorous diet, a careful abstinence from all saline, alkaline, or greasy foods or condiments, with a persevering application of such forms of general bathing as the

general constitutional condition demands, are the essentials of the plan. The rubbing wet sheet, with frequent hip and foot baths, as derivatives, make a good bathing arrangement. If the skin is obstructed or bilious, the pack sheet should be occasionally resorted to; and it is more or less frequently useful in nearly all cases. After the general health has become substantially improved, warm, and then tepid, and then cool injections, should be thrown into the ear, if, as is usually the case, there is more or less deafness, and this should be persevered in for weeks and months, if necessary.

DEAFNESS.—The pathological conditions, structural and functional, of the various parts entering into the formation of the ear, which may produce a greater or less depravation of the sense of hearing, are very numerous; and many of them are exceedingly difficult of diagnosis. Fortunately, the worst cases are of rare occurrence; and those which are common are easily discriminated, and successfully treated.

DEAFNESS FROM COLDS.—A state of atony, or sub-paralysis of the auditory nerves, from "taking cold," frequently occasions deafness in one or both ears, for days, weeks, or months. It is curable by persevering tepid injections, with due attention to the general health.

DEAFNESS FROM HARDENED EAR-WAX—An accumulation of hardened wax, obstructing the function of hearing, is generally the result of an erythematic inflammation of the auditory passage. Persons of bad habit of body, torpid skin, deranged digestion, etc., are peculiarly liable to this affection. It is known by an increased sensibility or soreness in the meatus, a sense of itching, and often a burning or pricking sensation, confusion in the head, noises in the ear, with a tearing or dragging sort of pain about the ear and head.

It is curable in the same manner as the preceding; but due attention to the general health is the leading indication; and among the most important of the hygienic appliances is a rigidly plain and unconcentrated diet. Head-baths are useful when the inflammatory symptoms are prominent.

DEAFNESS FROM EXCRESCENCES.—Morbid excrescences, usually soft wart-like tumors, or spongy vesicular polypi, are sometimes found in the ear-passage. They are the result of chronic inflammation of the follicles of the meatus, or the membrana tympani. These excrescences are red, sensitive, and readily bleed when irritated, except in a few cases, when they are hard and indurated. To detect their character

the meatus must be examined with the ear speculum, or a common triangular reflecting prism of flint glass, by which light can be sent to the bottom of the external ear-passage.

Treatment.—In treating these conditions, the inflammatory action should be subdued, and the general health restored, as already mentioned, and then the fungus growths extirpated, after which, both tepid and cold injections should be employed for a considerable length of time. The polypi and other tumors can generally be eradicated by a pair of fine curved scissors, or a curved double-edged knife, having a blunt and rounded extremity, or a pair of delicate forceps, with sharp points, or with a ligature passed around them, and occasionally tightened until they are cut off. Such excrescences as are incapable of removal by mechanical means, can generally be destroyed by caustics, for which purpose they may be repeatedly touched with nitrate of silver. Its employment demands great care, to prevent the sound parts from being cauterized also.

Deafness from Abscess.—The abscess is a phlegmonous inflammation of the cellular tissue of the passage, usually caused by severe cold or exposure to strong currents of air. It should be treated precisely like acute inflammation.

Deafness from Caries.—Some persons are affected with, and children of a scrofulous diathesis are very liable to, an inflammation of the periosteum, which generally results in inflammation of the bony structure, and frequently terminates in exfoliation of the diseased bone, by which the passage is narrowed or obliterated. The inflammatory stage should be treated by the means previously recommended, and as the healing process goes on, the passage should be prevented from closing by caustic or metallic tubes. The hearing always remains dull in these cases.

Deafness from an Altered Membrana Tympani.—Neglected or maltreated inflammatory affections are occasionally followed by a thickening, opacity, fungous excrescence, or destruction of the membrane of the drum. Sometimes the membrane, examined by the speculum, appears as if covered by small projecting glands or follicles; at other times it is very red and vascular, the blood-vessels being distinctly visible. The pain is accompanied by buzzings, as if something were fluttering in the ear, and by diminished hearing. The pain is increased by loud sounds, by variations of temperature, and by pressure upon the ear.

Treatment.—There is nothing peculiar in the treatment of this affection, as distinct from that of the other forms of inflammation and its consequences, already described. It is worth remembering, that in many chronic diseases of the head, and particularly of the ears, derivative, hip, and half-baths are among the best applications. They should be as lengthy as the patient can bear them, without disagreeable feelings in the brain or lungs, generally thirty or forty minutes. Artificial perforation of the membrana tympani has been frequently performed in cases where it was so thickened as to nearly or quite destroy the hearing; but it has seldom succeeded in restoring it.

Deafness from Diseases of the Eustachian Tube.—The Eustachian tube is sometimes obstructed by the presence of tumors in its vicinity, by inflammation resulting in swelling of the mucous membrane, effusion, constriction or obliteration of a portion of the canal. These conditions cannot well be ascertained without explorations by ear forceps or catheters. Injections of warm water, and of air, have been employed to ascertain the nature and extent of any existing obstruction; but all these operations are attended with no small degree of danger. Several fatal accidents are recorded in medical journals, as having recently occurred in London, from the pumping of air from a press into the Eustachian tube. The wisest policy in these important cases is to be content with the thorough employment of all measures conducive to the general and local health.

Catarrhal affections, inflammation of the throat, and eruptive fevers, not unfrequently leave an accumulation of mucus in the Eustachian tube, obstructing it, and occasioning more or less deafness. In such cases cold water gargles are an excellent addition to the general plan of treatment.

An inflammation principally confined to the mucous membrane of the Eustachian tube, which is often but the extension of a disease of the throat, frequently causes deafness. When this inflammation is confined to the guttural part of the tube, the patient hears well at times, but only momentarily. His own voice sounds worse to him than the voices of others, and has sometimes a gurgling, crackling, or detonating sensation. The pain is greatly increased on gaping, or by the act of mastication. Ice-cold gargles, with the whole general anti-inflammation treatment, should be perseveringly employed.

Enlarged tonsils sometimes press upon the guttural extremity of the Eustachian tube, so as to produce deafness, as also do fungous excrescences, polypi, and enlarged parotid glands. Those obstructions, of course, must be removed by ligature or excision; though enlarged ton-

sils can generally be reduced by cold gargles, and thorough general treatment, with a rigidly abstemious diet.

Deafness from Extravasation.—External injury, violent sneezing, or severe constriction of the neck, may produce a lesion, causing an extravasation of blood in the cavity of the drum. Cold compresses, gargles, injections, and any other baths demanded by the state of the general system, will generally produce an absorption of the extravasated fluid, if it does not pass off by the Eustachian tube, and remove the deafness.

Nervous Deafness.—The term nervous, in this sense, is very indefinite. It is applied by medical authors indiscriminately to all forms of impaired hearing, unconnected with *apparent* inflammatory phenomena or structural changes. The proximate causes of this form of deafness are numerous: it may arise from simple atony, paralysis, or exhaustion of the nerves pertaining to the sense of hearing, or those nerves may be compressed by tumors, purulent formations, or extravasations, not manifested by any external symptoms; or from organic affections of the brain pressing on the origin of the nerves.

The most prominent symptoms which indicate compression of the nerves are vertigo or dizziness, severe and constant headache, noise in the ears, weak sight, and defective memory. It is generally incurable, although the means applicable to the preservation of the general health may prevent the further progress of the condition producing the deafness; and in some cases the hearing may be greatly improved by the same sanatory measures.

Palsy of the acoustic nerve arises from severe shocks, contusions of the brain, convulsions, apoplexy, fever, plethora, and still more frequently from sympathy with some chronic derangement of other parts or organs, generally the digestive. The reader need not, perhaps, be told that in all the affections of this class, which, in fact, are many, the prospect of cure depends entirely upon the degree of general health which can be reproduced.

Dumb Deafness.—Deafness in infancy may arise from original constitutional malformation, or from structural diseases occurring in the early periods of life. When congenital, it is incurable; but in many cases resulting from diseases in the first few years of existence, a cure may be effected by careful attention to the local condition and general health; it is especially important to avoid all concentrated and stimulating articles of food in these cases.

Senile Deafness.—Old age should not, in a natural development and decline of the bodily functions, be subject to deafness, blindness, nor other loss of external sensibility, only in the ratio that all the physiological functions cease to perform their offices. But the usual habits of living tend to thicken the fluids and hasten these results prematurely—the fine capillary vessels of the delicate structure of the organs of sense become obstructed, and their functions impaired disproportionately to those of other and more vital organs. Hence the great frequency of deafness in old persons. We have no panacea to offer in this relation, of preventive or curative efficacy, save a life in conformity with the laws of life.

Earache—Otalgia.—This is usually symptomatic of inflammation, or of foreign bodies or insects in the meatus. But the affection, considered as idiopathic, is of a nervous, neuralgic, or rheumatic character, coming on abruptly, and disappearing suddenly, and is unattended with febrile irritation. Noises in the ear, and slight deafness, are frequent accompaniments of otalgia.

Treatment.—Fasting a day or two, syringing the ear with warm water, and a few tepid foot-baths, will generally soon remove the worst attacks. A warm or vapor bath, or a wet-sheet packing, will often remove the trouble at once. If the stomach is foul, a warm water emetic should be employed, and if the bowels are not entirely free, copious warm water injections are advisable.

Foreign Bodies and Insects.—Children at play occasionally put beans, peas, small pebbles, and other substances into the ear-passage. These may remain an indefinite time without trouble; but frequently inflammation and ulceration ensue, with a constant discharge of irritating or fetid matter. They often produce the most intense agony, and are sometimes so surrounded by fungous growths as only to be detected by the most critical examination with the speculum, forceps, or probe. If the body be hard, as a stone or metallic substance, the grating of the probe will discover it.

Their removal by mechanical means requires the most careful and dextrous management, to avoid injuring the adjacent structures.

Insects and worms sometimes effect a lodgment in the meatus, producing awful suffering. There is little doubt that inattention to cleanliness, particularly in diseased or ulcerated states of the passage, attracts the animals to deposit their ova there, which in time are converted into worms; and it is possible they may be generated there as they are in a morbid condition of the secretions of the mucous membrane of the

stomach and bowels. In either case they are unprofitable and dangerous residents.

When they can be seen, they should be removed with the forceps. A pledget of lint, covered with some viscid substance, as oil and honey to which worms when small and numerous will adhere, will often enable us to remove them. They may be destroyed also by narcotic poisons as oil of almonds, or a strong infusion of green tea, or tobacco.

CHAPTER IX.

ERYTHEMATOUS INFLAMMATIONS.

In the loose, slip-shod medical literature of the day, the terms, erythematic, or erythematous, and erysipelatous, are indiscriminately applied to a great variety of topical, eruptive, and symptomatic inflammatory affections, some of which are actually exanthems, or eruptive fevers, and others mere rashes, attended with little or no constitutional febrile disturbance. In its strictest sense, erythema means inflammatory blush, and is applied to those external manifestations of inflammation which are not necessarily connected with fever; whereas erysipelas is usually limited to an eruptive fever. Again, therefore, I find it necessary to sacrifice uniformity of method to convenience—my limits precluding the idea of a perfect nosological arrangement—and comprise, in the present chapter,

Erythemas	Œdematous,	Exanthematous	Rash Exanthem—Nettlerash.
	Erysipelas,		
	Gangrenous,		Icherous Exanthem { Aptha, Pemphigus
	Vesicular,		
	Anatomical,		
	Chilblain,		Carbuncular Exanthem—Yaws.
	Fret.		

Erythemas.—All the varieties of erythema are characterized by red, tumid, fullness of the skin, disappearing on pressure, attended with a burning pain, and terminating generally in cuticular scales, or vesicles, sometimes in ulceration, and more rarely in gangrene.

In the *œdematous* variety the skin exhibits a bright scarlet color; the affection spreads widely and deeply through the areolar tissue,

which often suppurates imperfectly, and occasionally sloughs and becomes gangrenous. The swelling is principally caused by extravasated serum; it is generally found in dropsical constitutions, and usually denominated, "*œdematous inflammation.*"

In *erysipelatous erythema* the color is of a deeper red, and superficial, with a determinate edge, usually in a serpentine or winding direction, the part first attacked healing as the disease extends over the surface. This form is called "*erysipelatous inflammation*" in many medical books. Sometimes, though rarely, it is attended with some degree of extravasation, producing a soft swelling, and attended with a shining surface. It often follows wounds, injuries, and surgical operations. In some cases it extends beneath the skin, and runs into suppuration and mortification, constituting the *erysipelas phlegmonodes* of Galen.

Gangrenous erythema is characterized by a superficial dusky red color; a bloody serum separates the cuticle from the true skin; the cutis, when denuded, exhibits dark brown spots, which are disposed to blister and slough. It attacks chiefly the extremities. It is always found in extremely relaxed and debilitated constitutions, and is most common in advanced age, especially when the vitality has been prematurely exhausted by narcotics and stimulants, as tobacco and alcohol. It is sometimes, however, seen in weakly infancy. Either of the preceding varieties may pass into the gangrenous form.

In the *vesicular* variety the color is pale red; the surface is roughish, and covered with minute crowding vesicles, filled with acrid, often reddish fluid. Authors distinguish two sub-varieties: the first, *benign*, in which the vesicles advance without a breach of the cuticle; and the second, *corrosive*, in which the vesicles break in the part first affected and the corrosive fluid produces tracts of sanious ulceration as the redness advances. This and the preceding variety were called *ignis sacer—holy fire*—by the ancients, from the superstitious notion that they were special inflictions of the Deity, or of His ministers. There are also sub-varieties of this form of erythema, produced by the medicinal administration of mercury and arsenic; the former has been called *erythema mercuriale* and *hydrargyria* in medical books.

The *anatomical* variety is the erythematous inflammation, which arises from dissection. Unlike all the other forms of erythema, and, indeed, unlike most other inflammations originating from a local cause, it commences, at least in the great majority of cases, with a constitutional febrile disturbance; the local affection first appearing about the shoulder or axilla, while the injured part shows little or no inflammatory action. The characteristic symptoms, as well stated by Dr. Good, are

Inflammation, with lancinating pains about the axilla, shooting down the chest, ushered by severe rigors and anxiety, succeeding rapidly to the dissection of a fresh corpse, with a puncture or abrasion of the hand of the anatomist; blush, a deep crimson, with a spongy fullness, chiefly over the pectoral muscle; fever, a typhus." Those few cases in which the local symptoms take the lead of the constitutional, are always the least dangerous; and this remark probably holds true with every form of disease resulting from local injury or infection.

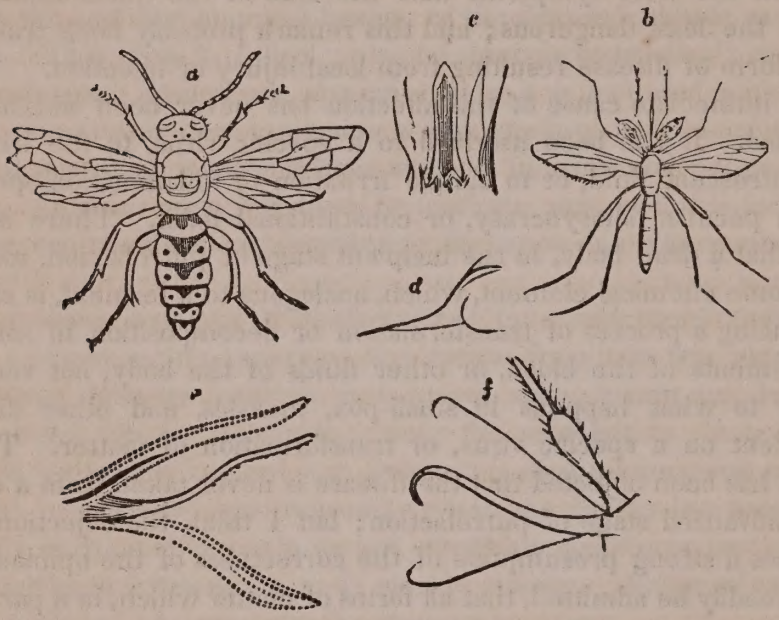
The immediate cause of this affection has never been satisfactorily explained. It has been ascribed to a specific virus, to the irritation of a putrescent fluid, or to simple irritation or inflammation operating upon a peculiar idiosyncrasy, or constitutional habit. There is little doubt that a dead body, in the incipient stage of putrefaction, may develop some chemical element, which, analogous to a ferment, is capable of inducing a process of transformation or decomposition in some of the elements of the blood, or other fluids of the body, not very dissimiliar to what happens in small-pox, measles, and other diseases dependent on a specific virus, or transformation of matter. To this view it has been objected that the disease is never taken from a corpse in the advanced stage of putrefaction; but I think the objection itself furnishes a strong presumption of the correctness of the opinion; for, it will readily be admitted, that all forms of matter which, in a particular stage of the process of decomposition develop an infectious or poisonous principle, must necessarily be changed into something different if the process of decomposition goes on. Thus yeast, the vaccine virus, and alcohol, all products of decomposition or putrefaction, may be resolved into very different and comparatively inert compounds of elementary matters, by further decomposition.

The local inflammation and the accompanying fever resulting from the bite of venomous serpents—as the cobra de capello, and rattlesnake, from whose virus death often results within twenty-four hours—in all essential circumstances, resemble the erythema before us; the chief difference being that the local and constitutional symptoms both commence and continue simultaneously, while the progress of the disease is much more rapid, the vitality being, as it were, destroyed as by an electric shock, by the first impression of the poison.

There are also two classes of insects which occasion more or less local inflammation of an erythematic character, in some cases followed by a constitutional disturbance similar to that of anatomical erythema, and in a very few cases terminating in death. The first class—as bees, wasps, hornets, ichneumons, etc.—sting, and the second class—as the gnat, horsefly, flea, bug, etc.—pierce the skin and suck the

blood. Whether the injury results mainly from poison, or the irritation of a rough, ragged wound, is not, in all cases, clear. The following cut exhibits the instrumentality by which these insects pierce, cut, and tear the fine capillary network of blood-vessels and nerves:

Fig. 185.



STINGING AND BITING INSECTS.

In Fig. 185, *a* is a representation of the hornet; *b*, the gnat; *c*, lancets of horsefly; *d*, sting of wasp; *e*, lancet of flea; *f*, lancets of bug.

The variety called *chilblain*, or *pernio*, affects principally the hands and feet, and is occasioned by exposing the parts alternately to extreme cold and heat. In very cold climates the nose, ears, and lips are sometimes destroyed by it. The skin is of a crimson color, suffused with blue, and is troubled with an excessive and obstinate itching.

The remaining variety—*fret*, *intertrigo*, *erosion of the skin*—is generally seen behind the ears of children, and about the groins and anus of children and adults. The inflamed part is of a bright red color, the cuticle is eroded, and the exposed skin oozes a limpid and acrimonious fluid; the discharge is often peculiarly offensive. The whole theory of its nature, advanced by Dr. Good, in his elaborate "Study of Medicine," is in the following words: "It is an erythema with weak vascular action, and often considerable irritability, in consequence of such weakness." The plain English of the matter is this. It is an erythema with filthy personal habits, and always considerable uncleanliness of the skin as a consequence of such habits. I have never known a man

woman, or child who took a daily bath or wash over the whole surface, to be troubled with it.

Treatment.—In the first four forms of erythematic inflammation, we have to deal with local irritation, in connection with great general debility; in the fifth-named variety these conditions are coupled with the peculiar morbid action of a specific virus; while in the last two varieties the only morbid condition is irritation. The indications of cure are, therefore, sufficiently obvious.

Œdematous erythema is rarely found except as symptomatic of some primary malady; but when occurring idiopathically, the local wet compress, frequently alternated with gentle friction by means of soft flannel or the bare hand, and the general tepid or cool ablution, or half-bath, constitute the leading remedial measures. Bandages of wet linen, when the absorbents are nearly powerless, and the accumulated fluid produces very painful distension, are frequently useful auxiliaries, provided they are evenly and smoothly adjusted.

From the facts that erysipelatous erythema frequently attacks children soon after birth, and that children are sometimes born with it, we may reasonably infer that the malady is closely allied to the voluntary habits, especially the dietetic habits, of the patient, or, in case of infancy, the mother. Hence a strict and rigidly simple dietary is of first importance in the remedial course. The greater tendency to general fever requires more thorough general bathing, and frequently a resort to the wet-sheet pack.

The gangrenous and vesicular forms require more particular attention to the local treatment. While the general treatment is regulated by the superficial heat and the feelings of the patient, the temperature of the water being as cool or cold, but no colder, than is compatible with a prompt and comfortable glow on the surface; the local applications should be very cold, so as to produce a tonic and constringing effect. If very cold applications are painful, they need not be continued long at a time, but may be frequently repeated.

Allopathic authorities have not yet settled the question whether the antiphlogistic plan—bleeding and reducing, or the stimulating plan—bark and wine—is the most proper; for neither claims to be successful. Messrs. Hutchinson and Lawrence, eminent European surgeons, recommended making numerous and extensive incisions in the affected parts, with a view of arresting the disorganization of the structures; a practice which has been copied by several American practitioners, though not, I believe, with such success as will commend its general repetition.

I am not aware that any hydropathist has had an opportunity of test-

ing the new system in a case of erythema arising from dissection; nor do I believe that *all* cases could be cured by hydropathic, or any other means. Some anatomists who become thus affected are among those whose physiological habits, especially in the matter of eating and drinking, are gross and unhealthful; hence they *may* have that degree of putrescency of blood which can offer but slight resistance to the destructive action of the infectious principle; an attack, therefore, may be certain death. And the same remarks apply to the bites of venomous serpents. But the most hopeful plan of treatment is clear. The intensity and malignancy of the disorganizing inflammation should be opposed by a succession of wet-sheet packs, sufficient to keep the morbid heat in check, and promote free perspiration, if possible. In a later stage of the disease, when the strength is much exhausted, and the extremities inclined to coldness, I would employ the warm wet-sheet, and apply hot bottles to the feet. Water-drinking should be insisted on to the full extent of the stomach's capacity to receive it without painful repletion. I am not aware that any advantage is pretended to have been derived from any of the numerous local applications which have been tried. In the erythema from the virus of serpents, a ligature above the injury, if applied *immediately* after the bite, or the removal of the wounded part by excision, or the actual cautery, when resorted to *instantly*, have no doubt many times materially abated the violence of the disease, or possibly have prevented it altogether. And in some instances it is said that sucking the poison from the wound very soon after the serpent's fang has been withdrawn, has prevented all injurious consequences—the mouth being defended by a wash of olive oil. It is exceedingly difficult to determine the value of these resources, for the reason that the majority who are bit are not poisoned at all; hence a remedy perfectly inert may acquire the reputation of a specific. It is worthy of remark, however, that the virus of the rattlesnake—and the same is true of the fetid secretion of the skunk, and, indeed, of the venomous matter of most, if not all, poisonous serpents, reptiles, and insects—is not dangerously noxious when taken into the mouth or even into the stomach in considerable quantities; indeed, it has been employed in one, two, and three deep doses as an antispasmodic, in difficult breathing, asthmatic affections, etc., its sensible operation being rather agreeable, nervine, and somewhat exhilarating, like the effect of castor, musk, and similar animal secretions. Compressing the vessels around the bitten part very soon after the accident by a cupping-glass or any similar instrument, by interrupting the process of absorption, may contribute something to the safety of the patient. The general treatment is, of course precisely the same, whether the system is poisoned from

the ingenerated virus of a dead corpse, or the venomous secretion of the living reptile. The irritation or poison resulting from the stings or bites of insects is most promptly relieved by the coldest water, and the preferable mode of application is the constant stream or douche. The constitutional affection, should it supervene, requires the same management as the anatomical variety.

Chilblain requires a daily general bath or ablution, and frequent local bathing in the coldest water. As a prophylactic, the patient should never suddenly approach a hot fire when the feet and hands are very cold.

The last named variety, as already intimated, only requires that the skin be well washed all over once a day, or oftener, with pure cold water. If there be any sufferers who cannot possibly be satisfied without some "medicated" wash, a small quantity of either bar or soft soap may be added to the water. Like all the empirical infallibles of the day, "it will do no harm, if it does no good."

NETTLE-RASH—URTICARIA.—Some authors have treated of this disease as a variety of scarlet fever. The precursive fever is slight, although the stomach usually manifests considerable disorder. The rash appears about the second day, attended with a peculiar itching, like the sensation produced by nettle-stinging; the eruption wanders from part to part, and fades and revives irregularly. It terminates in a few days with cuticular desquamation.

Special Causes.—Irritating, constipating, or indigestible food; salt, vinegar, spices, narcotics, shell-fish, stale sausages, old cheese, frowzy butter, tainted animal flesh, etc.

Treatment.—A warm water emetic, tepid injections daily to keep the bowels free, a daily dripping-sheet or half-bath, with plain and abstemious diet, are all that need be said on this subject.

APTHA—THRUSH.—This disease consists of minute vesicles, containing, when matured, a whitish or milky fluid. Authors distinguish three varieties: *infantile*, or *white thrush*, appearing in infants soon after birth, often extending from the mouth to the stomach, and even intestinal canal; the vesicles granular, roundish, and pearl-colored, and terminating in curd-like sloughs; *malignant*, or *black thrush*, is seen most frequently as a symptomatic affection in typhus and malignant fevers; but it is said to be sometimes found idiopathically in old age, and other exhausted states of the vital powers; the fever is a strongly-marked typhus, and the sloughs are dark-colored or black; *chronic thrush* is attended with great emaciation and hectic fever the eruption

extends through the whole length of the alimentary canal, the edges of the tongue are affected with pimples, superficial blisters appear within the mouth and fauces, and the stomach is at all times troubled with a sense of heat and soreness. Diarrhea often attends, and ulcerations of the bowels are frequent consequences.

Special Causes.—Hot drinks; the excessive use of tea and coffee, especially the drug-colored *green* tea of commerce; highly-seasoned food; confined air; repelled eruptions; too concentrated food; rancid grease of any kind; pork gravies; retained animal putrefaction, from inattention to bathing the skin, etc.

Treatment.—The abdominal bandage, the wet-sheet pack once or twice a week, cool injections daily when diarrhea attends, moderate drinking of cool, but not very cold water, a daily half-bath, ablution, or dripping-sheet; and the adoption of a bland, simple, strictly vegetable diet, save the article of milk; with a strict avoidance of all the producing causes, comprise the remedial plan.

Pemphigus—Vesicular, or Bladdery Fever.—This affection is generally symptomatic of visceral inflammation; though several nosologists of celebrity describe it as an idiopathic disease, and even distinguish it into several varieties. Its diagnosis is, transparent vesicles scattered over the body; filbert-sized, with a red, inflamed edge, but without surrounding blush or tumefaction; the vesicles contain a fluid which is pellucid or but slightly colored; on breaking, the vesicles are disposed to ulcerate; and the affection is accompanied with a fever of the typhoid type.

In the variety called *vulgaris—common vesicular fever*—the vesicles appear from the second to the fifth day, in successive crops, often extending over the mouth and intestinal canal; another variety, called *glandular*, is preceded by swelling of the neck and throat, and in Switzerland, where it has been chiefly noticed, it is considered as highly contagious; and a third form, termed *infantile vesicular fever*, attacks infants soon after birth.

Treatment.—As this disease, in its essential nature and causes, is nearly allied to the preceding, the treatment need not be materially different. In many cases, frequent sponging with tepid water is sufficient. M. Langhaus, who has given us a description of the glandular pemphigus of Switzerland, and who treated the disease by bleeding and sweating, tells us, with a self-stultification peculiar to the school to which he belonged, in one part of his narrative, that "it was so contagious as to spread with great rapidity through numerous families, and so malignant that *all* persons affected by it died" and yet, in allu-

sion to his bleeding and sweating, recommends it, "with the most sanguine hope that t will effect a speedy cure."

YAWS.—*Rubula* and *frambœsia* are other terms by which this disease is known. Some nosologists have classed it among the eruptive fevers, although the attending fever is merely adventitious; while others have regarded it as properly belonging to the order of tumors. It resembles syphilis and other infectious diseases, in being communicable by contact; and the exanthems and contagious diseases in rendering the body invulnerable to a second attack.

Symptoms.—The disease consists of numerous and successive tumors, commencing with mere specks, and gradually increasing to the size of a raspberry, which they somewhat resemble; some of the smaller papulæ become real pustules, and discharge an opake, whitish fluid when broken, and concrete into dense scabs or crusts; the larger run into fungous excrescences, and in their granular surface, as well as size and color, resemble the raspberry, from which their name is derived. These tumors, one of which becomes, at length, much larger than any of the rest, have but little sensibility, suppurate very imperfectly, and discharge a sordid, icherous matter. They originate in scattered groups over the body, and their connection with personal uncleanliness and infection is sufficiently evinced by the fact, that they are chiefly found in the groins, axillæ, about the anus and pudenda, though they often disfigure the neck and face.

This is one of the most unsightly diseases known; and nothing can exceed the revolting spectacle of a West India yaw-house, where the slaves, suffering under this disease, are collected together. Dr. Good has distinguished the disease into two varieties—*African* and *American*. The diversity of the symptoms, however, is slight, and attributable wholly to local circumstances. In duration the disease varies from one to three months. Sometimes callous tumors are formed on the soles of the feet, in consequence of the yaw-tubercles not being able to press through the thick skin; these are called *tubba*, or *crab-yaws*, and greatly impede the exercise of walking.

Treatment.—One or two tepid or moderately cold general baths, either by the dripping-sheet, pack, or ablution, with a strictly vegetable and rigidly simple and abstemious diet, are the proper therapeutic appliances.

CHAPTER X.

SPASMODIC DISEASES.

THERE are a variety of diseases, whose most prominent phenomena are: irregular muscular contractions, in some cases amounting to a more or less permanent rigidity of particular muscles, and in others attended with convulsive agitation of some part or of the whole muscular system. These may be conveniently grouped in the present chapter in the following manner:

Comatose Spasm	Convulsion, Epilepsy, Hysterics.
Synclonic Spasm	Tremor, Delirium Tremens, Shaking Palsy, St. Vitus' Dance, Raphania, Barbiers.
Suffocative Spasm	Cough, Dyspnœa, Asthma, Laryngismus, Incubus, Bronchitis, Sternalgia, Pleuralgia,
Clonic Spasm	Hiccough, Sneezing, Palpitation, Nictitation, Subsultus, Stretching.
Constrictive Spasm	Hydrophobia, Acrotismus, Tetanus, Locked-Jaw Cramp, Muscular Spinal Distortion, Muscular Stiff-Joint. Wry Neck.

The generic distinctions in the above arrangement may be thus defined: The *comatose* spasm is attended with muscular agitation, diminished sensibility, inability of utterance, followed by a tendency to drowsiness; the *synclonic* spasm is characterized by a simultaneous trembling, or chronic agitation of various sets of muscles, especially when excited by the will; the *suffocative* spasm disturbs, momentarily or permanently, the muscles of respiration alone; the *clonic* spasm is the forcible excitation of one or more muscles in sudden and irregular snatches; and the *constrictive* spasm is an irregular form of muscular contraction producing rigidity.

CONVULSION.—Deaths from convulsion-fits, especially among the

infantile population of our country, are becoming alarmingly frequent In the city of New York its fatality ranks next to that from consumption, and is all the while increasing, and as far as I have been able to gather information on the subject, the same is true of nearly all parts of the United States. *Why* twenty or thirty children, all of them not far from two or three years of age, should die weekly the year round, in this city, from this disease, may well engage the earnest thoughts of philanthropists and physicians, and, above all, of mothers.

Although convulsion occasionally attacks persons in all periods of life, the disease, as already intimated, is conspicuously frequent and fatal in infancy; pregnant women are also, after the sixth month, during labor, and immediately afterward, liable to the disease then denominated *puerperal convulsions.*

Symptoms.—The muscular agitations are violent, and with very young children the spasmodic movements are extremely rapid; the fingers work, and the eyelids quiver; the teeth gnash; sometimes the convulsive motions skip from one part to another; at other times the body is universally convulsed; occasionally the paroxysms intermit and recur at irregular intervals; often they are accompanied with shrieks or yells. In infancy, the disease is usually preceded by twitchings and startings, and accompanied with a blueness about the eyes and upper lip. When it occurs in adults, the muscles are powerfully exercised, the mouth foams, the eyelids open and shut perpetually, or are stretched upon a full stare, while the protuberant eyeball rolls rapidly in every direction, and the whole face is hideously distorted.

Special Causes.—In the course of this work I have more than once had occasion to allude to the unhealthful habits and fashions which prevail in fashionable, and, indeed, in nearly all civilized society, in the matter of rearing children. The disease before us is one of the many special evidences of the general bad feeding, bad dressing, bad doctoring, and bad management that rule in the nursery; and as especially prominent among the special causes may be named concentrated food and confections—baker's bread, sweet-cakes, candies, etc.—and the paregoric and purgatives which are given to silence the pain and remove the constipation which they produce.

Treatment.—The first thing to be done in a convulsion-fit is to expose the patient to abundance of *cool* air and plenty of *cold* water. There is no danger from any amount of ventilation in the coldest of weather while the fit continues. The cold ablution, or dripping-sheet, will answer for bathing purposes, but the half-bath, during which the surface is actively rubbed with the bare hand, is the preferable mode. As the bowels are usually clogged with il.-digested matters, or irritated

by acrimonious secretions, tepid injections should not be omitted. After the spasms are overcome, the prophylactics to employ in the intervals are brown *home-made* bread, and milk, potatoes, squashes, pumpkins apples, etc., and a daily bath or universal wash-down.

EPILEPSY—FALLING-SICKNESS.—Epileptic fits present all degrees of violence, from a slight general spasmodic agitation and distortion of the muscles of the face, with a momentary suspension of consciousness, succeeded by a sense of drowsiness or stupor scarcely appreciable, to the most violent convulsive movements of the face and chest. while the limbs are fixed and rigid, and followed by several hours of total unconsciousness.

Symptoms.—In some instances the disease is ushered in by precursive symptoms, which warn the patient of the approaching attack. The most usual of these is a sensation of a cold creeping vapor from some particular part of the body, which has been called an *aura epileptica*. But more generally the paroxysm comes on suddenly, and often commences with a startling scream; the patient is instantly deprived of all sense of perception and power of motion, and if standing, he falls, while the body is more or less convulsed; the muscles of the face and eyes are always much affected, and the countenance violently distorted; the tongue generally protrudes from the mouth, which discharges a frothy saliva; the lower jaw is strongly convulsed, and the teeth, gnashing upon the tongue, often wound it severely; sometimes the urine and fœces are discharged involuntarily. A profound lethargic sleep succeeds the severer attacks, from which the patient at length awakes, unconscious of having suffered pain.

When the disease is owing to an organic cause, the attack is more abrupt; the patient suddenly falls prostrate; there is more rigidity and less spasmodic agitation of the muscles, and optical illusions are very common. This form of epilepsy has been called *falling-sickness*, or *cerebral epilepsy*.

Special Causes.—Among the organic causes are various structural derangements, as misformation of the head, external injuries, internal tumors or collections of matter. When the disease is functional, the causes which specially excite the paroxysm in the individual predisposed to it, are—strong mental emotions, especially of the depressing kind, as anger, grief, fright; indigestible food, an overloaded stomach, or any source of gastric irritation, may prove an exciting cause; repelled eruptions, and the sudden suppression of customary evacuations, have induced it; exhausting indulgences, either in the exercise of the lower animal propensities, or in the use of stimulants and narcotics, frequently

occasion an attack; confirmed drunkards are peculiarly liable to it; in a few instances the disease has arisen from worms.

Prognosis.—The chance of cure will be favorable or unfavorable as the symptoms do or do not indicate functional derangement or local irritation as the cause. When connected with deficiency or malformation of brain, organic changes, or exhausted nervous power, it is generally, and probably always, incurable.

Treatment.—During the fit very little can be done, on account of the muscular distortions. Cold water, however, should be freely applied to the head, cold compresses to the stomach, and warm applications to the feet. In the intervals, the cure must be prosecuted by a careful attention to the general health; and here we have another condition where the dietetic part of hydropathy is more important than the watery, although both are useful. So utterly powerless for good, if not mischievous, has the drug-treatment proved in this disease, that one of the most experienced of the old school authors, Dr. Armstrong, testifies that he has seen more benefit derived from removing the exciting cause, than from any thing else. "As to diet," his language is, "*simplicity* in the kind of food, and *moderation* in its quantity, is the golden rule." In making the practical application of this golden rule, we should prescribe the dry diet as crusts of good brown bread, roasted potatoes, and good baked or boiled apples, as the leading articles. Caution must be exercised not to distend the stomach unduly with a variety at a meal, of even the blandest articles; very little drink should be taken at meals, and the supper should be extremely light, or what is better, altogether omitted. Among the bathing processes, derivative appliances—shallow-baths, sitz-baths, and foot-baths—should take the lead. As a general rule, they should be of short duration, and frequently repeated, so as to guard against determination to the brain. If the skin evinces considerable torpor or obstruction, the patient should be thoroughly rubbed in the dripping-sheet, or packed occasionally.

Hysterics—Hysteria.—This disease is commonly supposed to be peculiar to the female; but some authors, having noticed all its characteristic symptoms occasionally in the male subject, have described two varieties—*hysteria feminini*, and *hysteria masculini*. It is certainly more frequent in the female, and most disposed to show itself during the menstrual period.

Symptoms.—The precursive signs, which, however, do not always exist, are—a sense of nausea or sickness, flatulency, palpitation, depression of spirits, weeping, crying, etc., without any assignable cause

The fit soon follows, indicated by a coldness or shivering over the whole body; quick, fluttering pulse; a feeling of acute pain in the head, as though a nail were driven into it; there is often an acute sense of pain in the left side, about the flexure of the colon, with a sense of distension, giving the idea of a ball or globe rolling itself about in the abdomen, and gradually advancing upward till it gets into the stomach, whence, rising to the throat, it occasions a sense of suffocation, as if an extraneous body were pressing there; this feeling has been called *globus hystericus*. The convulsive struggle now commences, which is sometimes extremely violent; the trunk of the body is twisted backward and forward, the limbs are variously agitated, the fists are firmly clenched, the breast is spasmodically beaten, the muscles of the chest are agitated in every way, and the patient bursts into violent paroxysms of laughter, sobbing, or screaming, utters incoherent expressions, and is in a state of temporary delirium. On the cessation of the spasms, there are flatulent eructations, and a copious discharge of limpid urine, the patient usually lies stupid, and apparently almost lifeless, for a short time, but in an hour or so recovers the exercise of sense and motion, without retaining any distinct recollection of what has taken place, but feeling a severe pain in the head, and a general soreness over the whole body.

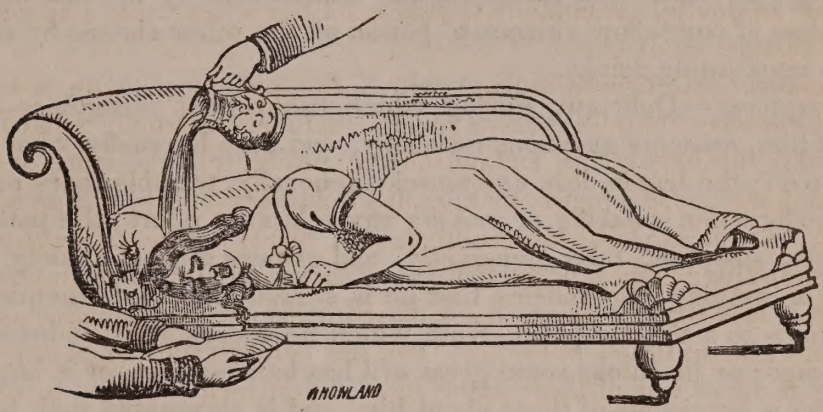
Diagnosis.—Hysteria may be distinguished from epilepsy by the insensibility being only partial; by the sighing and sobbing respiration; by the globus hystericus; by a peculiar trembling of the eyelid; and by the absence of distortion of the features. In a milder and modified form, the paroxysm consists of sudden insensibility, laborious breathing, swollen neck, flushed cheeks, and a closed and trembling eyelid, and the patient comes out of the fit talking incoherently, or crying and sobbing.

Special Causes.—Intense mental emotions, especially grief and anxiety; constipated bowels; excessive evacuations; obstructed menses; plethora; hot, enervating drinks, as tea and coffee.

Treatment.—A hysterical paroxysm is almost the only disease in the treatment of which allopathic and hydropathic practitioners harmonize. It is true the books recommend smelling-salts, asafœtida, fetid spirits of ammonia, ether, castor, musk, valerian, skunk-cabbage, opium, etc., yet the same book-makers are kind enough to tell us they do no good! Says Dr. Guy, author of a Medical Jurisprudence: "Cold affusion is the *only* remedy which can be relied on, and is worth a whole pharmacopœia of antispasmodics." Drs. Hooper, Good, Cooper, Neill, Smith, and Copland—all accredited authors of the drug school—recommend the cold-water practice. And Dr. Alfred Smee, F.R.S.,

surgeon to the Bank of England, etc., gives the following directions, illustrated by a plate. both of which are worth copying:

Fig. 186.



TREATMENT OF HYSTERIA

"Place the head over a basin, and pour water from a jug over the head and chest till the patient becomes chilly and revives. Never use any thing but cold water for the hysterical fit, unless the party turn very cold, when you should discontinue it, and apply warmth to the feet. I once saw the cold applied for three hours, but the patient was quite well the next day."

To correct the condition on which the hysterical paroxysms depend, we must, during their intervals, employ the abdominal bandage, frequent hip-baths, and occasional dripping-sheets or packs. In almost all cases the bowels are more or less constipated, and the diet must be regulated accordingly.

Tremor—Trembling.—A tremulous agitation of the head, limbs, or both, especially on some voluntary exertion, often occurs in the progress of acute and chronic diseases. But in some instances the affection appears disconnected, as far as we can observe, with any distinct primary disease, although it is manifestly in all cases symptomatic of nervous exhaustion. It is produced by violent exertion, vehement indulgence of the mental or sexual passions, by various poisons, as mercury, lead, opium, tea, tobacco, and is only to be cured by religiously and perseveringly abstaining from all the debilitating causes which conduce to it; in brief, all the voluntary habits must be thoroughly orthotherapeutic.

Delirium Tremens—Drunkard's Delirium.—"This disease."

says Dr. Doane, "is unfortunately very frequent in the United States;" to which may be added, that hardly a day passes without some suicide or murder being chronicled in the newspapers as committed under its influence; nor can any different result be expected, so long as our law-making representatives authorize and commission by special license, one class of our fellow citizens to poison all the other classes by selling them intoxicating drinks.

Symptoms.—Delirium, during which the patient recognizes those about him, answers questions rationally, and does hurriedly what he is told to do; the hands, lips, and muscles generally, tremble more or less, especially when speaking, or making any voluntary effort; the patient is restless, sleepless, talks incessantly, and evinces a great anxiety to be doing something; he fancies that he is surrounded with enemies, or that he is in a strange place, from which he is constantly endeavoring to escape; or he thinks some great evil has befallen him, or is impending; he is suspicious of those about him, and is tormented with frightful images or sounds; and often appears to be searching earnestly in unlikely places after something on which his mind is intent. There is frequently profuse perspiration, a frequent pulse, and a moist and slightly furred tongue. In the most dangerous attacks the patient is himself not violent; but in more moderate cases, when the muscular energies are less prostrated, he is sometimes extremely furious.

Special Causes.—The habitual employment of alcoholic beverages in most cases; in a few instances the disease has arisen from the use of opium, tobacco, and tea. The immediate exciting cause is generally sudden abstinence from the accustomed stimulant, particularly if such abstinence has been preceded by an unusual debauch.

Treatment.—When the patient is not ungovernable the wet-sheet pack is the most soothing process we can employ; in other cases we must rely mainly on the tepid shallow-bath, accompanied with active and persevering friction; the dripping-sheet is also one of the best appliances when considerable feverish heat exists. When the stomach is foul, evinced by bilious taste and fetid breath, a warm water emetic is useful, or even the copious drinking of warm water without emesis; and a daily tepid injection is almost always serviceable. Cold cloths should be applied to the head, and when there is the least indication to coldness of the feet, the warm foot-bath should be prescribed. Either of the general baths may be repeated two or three times daily, or all of them may be alternated. When the patient is too irritable or restless to permit any general bath to be employed in the ordinary way, wet towels may be applied to the chest, abdomen, and thighs, and frequently renewed; and copious cold water injections may be thrown

up the bowels. In all cases cold water may be drank to any extent the thirst demands.

In relation to drug-treatment in this disease, the allopathic school is about equally divided between large doses of opium and liberal draughts of brandy. Dr. Johnson, in his "Domestic Hydropathy," tells us that the only way to cure the disease is to procure sleep; and that there is no way of procuring sleep but by means of large doses of opium; but the doctor climaxes his own climax of absurdity when he adds that, although the opium induces a sleep, which cures the delirium tremens, the patients often die in the sleep which the opium induces!

Shaking Palsy.—Paralysis Agitans.—The term palsy, is not strictly applicable to this disease, for the reason that, although there is a diminution of muscular strength and of voluntary power in the part affected, there is no absolute loss of muscular motion, nor of sensation, one of which, or both conditions, being always present in genuine paralysis.

Symptoms.—"Permanent agitation of the head or limbs without voluntary excitement; body bent forward, with a propensity to run and fall headlong; usually appearing after maturity." The first symptoms usually noticed are a slight sense of weakness with a proneness to trembling, commonly in the hands and arms, but sometimes in the head. These increase gradually and almost imperceptibly, until, in a few months, the legs begin to be similarly affected, and the body bends forward. As the disease progresses, the tremor becomes constant and universal; the muscles refuse to act in obedience to the will; and, should the tremulous agitation be stopped in one limb by a sudden change of posture, it soon makes its appearance in another. When he attempts to walk he is thrown on his toes and forepart of his feet, and thus compelled to adopt a running pace. In the advanced stages the tremulous motions also occur during sleep; the bowels become torpid, mastication and deglutition are difficult, and the saliva continually dribbles from the mouth. Toward the closing scene, the power of articulation is lost, the ordinary evacuations are involuntary, and coma with slight delirium occurs.

Special Causes.—Long exposure to damp, unwholesome vapors, nervine excitants, as ardent spirits, strong tea or coffee, narcotic poisons, as tobacco, nightshade, etc.; metallic vapors, especially mercurial; drastic purgatives. Those who are employed in mines, and hence constantly exposed to the exhalations of mineral vapors, are the most frequent and severe sufferers from this disease.

Treatment.—As the proximate cause is simple debility of the whole

nervous system, the simple indication of cure is to strengthen the system; the only point of skill is in adapting the processes to the particular condition of the patient. The best general plan is, a daily ablution, or thorough rubbing in the dripping sheet, early in the morning, one or two shallow or hip-baths in course of the day, followed by active friction with the dry sheet or dry hand; and where the system has been evidently poisoned with metallic emanations, moderate sweating, either in the wet or dry sheet, as often as twice a week. Cold water should be drank rather freely, and cold injections employed daily, just preceding the time when the bowels are or should be evacuated. The wet girdle to the abdomen is worth something. The food should be of the most bland and unconcentrated kind, as cracked wheat, dry brown bread, hominy, potatoes, baked, boiled, or uncooked apples, etc.

Nothing can be more obvious than the nature of this affection; and nothing can be more ridiculous than the reasoning on the subject in medical books, nor more absurd than the practice recommended. Thus Bonet ascribes the affection to a diseased state of some portion of the cerebrum; and Mr. Parkinson fixes the seat of the disease in the cervical portion of the spinal marrow, from which he *supposes it to shoot up by degrees to the medulla oblongata!* "The remedial process," says Dr. Good, "is not very plainly indicated;" yet he recommends *vesicatories* and other stimulants to the neck; *setons*, *caustics*, and even the *red hot iron* applied to different parts of the spine; and for internal remedies, *prussic acid* and *arsenic!!* Dr. Elliotson treated several cases with *copious bleeding*, *blisters*, *mercury*, *setons*, *zinc*, and *sub-carbonate of iron;* but save in a single instance, no benefit whatever was experienced. Such is a fair specimen of the "medical science" of the day.

Chorea—St. Vitus's Dance—Chorea Sancti Viti.—This disease is characterized by "alternately tremulous and jerking motion of the face, legs, and arms, especially when voluntarily called into action, resembling the grimaces and gestures of buffoons." The name of St. Vitus's Dance—in colloquial French, *Dance de St. Guy*—according to Horstius, was given to this affection, or some other resembling it, in consequence of the reputed cures produced on certain women of disordered mind, upon their visiting the chapel of St. Vitus, near Ulm, and dancing from morning till night, or until completely exhausted. Many marvelous stories are related of these dancers by the old writers, some of whom, in their easy credulity, give the patients credit for having danced a whole week or whole month together.

Symptoms.—The disease appears most frequently from the eighth to

the fourteenth year; and attacks boys and girls indiscriminately, but chiefly those of weak or impaired constitutions. Its approaches are slow, and are marked by variable and often ravenous appetite, loss of usual vivacity, swelling and hardness of the lower belly, and, in general, constipated bowels, which symptom becomes aggravated as the disease advances; slight, irregular, involuntary motions of different muscles, particularly those of the face, precede the more violent convulsive agitation. The convulsive motions present a great variety of appearances. The muscles of the extremities, of the face, those moving the lower jaw, the head, and the trunk of the body, are each at different times, and in different degrees affected; the patient walks unsteadily, his gait resembling startings or jumpings; and sometimes walking is impossible. The agitation of the muscles is constant during the day, but ceases during sleep. The eye eventually loses its lustre, the complexion becomes pale, and the countenance is expressive of languor and vacancy, giving the patient a fatuitous appearance.

Special Causes.—Repelled eruptions; lead; mercury; constipation, narcotics; worms. Dr. Good remarks, "The predisponent cause of this disease is an irritability of the nervous system, chiefly dependent upon debility, and particularly a debility of the stomach and its collatitious organs." The passage is certainly very fine, but if it has any particular meaning I am unable to discover it. Dr. Armstrong gives us a less eloquent but more practical view of the subject. "Chorea," says he, "is always preceded by some disorder of the stomach, liver, or bowels; and the affection which takes place in the brain and spinal cord seems to be secondary. You may always trace its rise to some improper diet."

Treatment.—The whole plan of medication named in the preceding disease is applicable here. The great majority of cases, however, will be found in connection with torpid liver, costive bowels, and obstructed skin; for which a thorough daily ablution, an injection every day, or every other day, and a diet of brown bread, wheaten grits, potatoes, and a moderate quantity of the best fruit, will be sufficient.

RAPHANIA.—This disease was first described by Linnæus, and so named because he supposed it to arise from eating the seeds of a species of wild radish, the *raphania raphanistrum*. Other writers have imputed it to spurred rye or ergot, and others to still other vegetable poisons. The symptoms indicate the operation of a narcotic; and probably several plants, and perhaps also different vegetables in a state of disease or decay, or in a particular stage of putrefaction, may generate the poisonous element

Symptoms.—The disease commences with cold chills and lassitude, headache, and anxiety about the præcordia; these are followed by spasmodic twitching, and afterward rigid contraction of the limbs or joints, with excruciating pains, often accompanied with fever, coma, or delirium, a sense of suffocation, and a difficulty of articulation. It continues from one to four weeks, and when fatal, terminates with a diarrhea, or convulsive paroxysm.

Treatment.—Moderate cold water-drinking, the free employment of cold water injections, the wet-sheet pack daily, or twice a day, when there is considerable feverishness, and at other times frequent tepid ablutions, constitute the leading measures of the curative plan.

Note.—An anomalous disease has, during the last ten years, prevailed in different parts of this country, more frequently in our Western states, to which the physicians have been unable to assign a name, and which strikingly resembles the disease before us. If it is not identical so far as its causes are concerned, it is sufficiently similar in character to be appropriately treated on the same plan.

Barbiers—Beribery.—This affection is probably unknown in this country. It is common to various parts of India, and of very frequent occurrence in Ceylon, and on the Malabar coast.

Symptoms.—General lassitude, painful numbness of the whole body, stiffness of the legs and thighs, and a spasmodic retraction of the knees, and inability to walk, are among the early symptoms. In some cases the limbs are paralytic, and spasmodic actions affect irregularly the muscles of the body, chest, and larynx. In a later period of the disease, the legs swell, and subsequently the whole body becomes bloated and œdematous, the internal cavities are filled with fluid, and, in fatal cases, extreme difficulty of breathing, great restlessness, intolerable anxiety, constant vomiting, and general convulsions, close the scene.

Special Causes.—Sudden transitions from a dry to a damp atmosphere, and from sultry calms to chilling breezes, are assigned, by medical writers, as the principal causes. But as the subjects of its attack are almost invariably persons of weakly constitutions, irregular lives, debauched habits, or liquor and tobacco topers, and above twenty years of age, it is evident that the causes named are only exciting circumstances, when the constitution is predisposed by debility, or the bad habits which cause the debility.

Treatment.—A daily ablution and half-bath, plain food, regulated exercise, according to the strength, and cold injections, would seem adapted to the therapeutic indication, which is essentially tonic

Cough.—There are three kinds of cough which are ranked as idiopathic diseases by authors—*common cough*, *dry cough*, and *hooping-cough*. They are all attended with a sonorous and violent expulsion of air from the lungs, from a spasmodic or convulsive action of the respiratory muscles; the first and second varieties are often symptomatic of a multiplicity of other diseases.

Symptoms.—*Common cough*, or *humid cough*, is accompanied with an expectoration of a mucous or serous fluid. The *dry cough* is so called because it is unattended with expectoration. In the *hooping-cough—kin-cough*, *pertussis*—it is accompanied with a shrill, reiterated hoop; vomiting is also a frequent incident. The last variety is contagious under certain circumstances, which are not very well ascertained. The disease comes on with the usual symptoms of catarrh; the excretion is always viscid, though small in quantity at first. The hoop, or sonorous spasm, is frequently violent, the face becoming turgid and purple from suffusion, and the eyeballs swollen and prominent. The paroxysms at first recur several times during the day, are most violent toward evening, and least so during the night. After the disease has continued some time, they return only in the morning and evening, and toward the end of the disease in the evening only. The violence of the disease varies from the slightest indisposition without feverishness, to the severest spasmodic agitation, attended with high and dangerous fever. Its duration varies from one week to one year, the usual period ranging from three weeks to three months. The pathognomonic sign of the hooping-cough is the noisy inspiration accompanied by a lengthened hissing. It is generally a disease of children, and the danger is in the inverse ratio to the age.

Special Causes.—The first and second varieties are produced by "colds," or the inhalation of irritating dust, vapors, or other extraneous particles. The third is the result of specific contagion.

Sequelæ.—Bronchial inflammation, consumption, and dropsy in the head, are commonly specified in medical books as among the sequelæ of all forms of cough, but more especially of the hooping kind. They are more commonly the sequelæ of the poisonous cough mixtures with which children are generally so liberally fed.

Treatment.—All forms of idiopathic cough may be very easily managed. Cold water should be freely drank; the diet must be plain and rather abstemious; and one or two ablutions daily, followed by thorough friction or active exercise, are, in the majority of cases, amply remedial. When the system is inclined to feverishness, the pack, prolonged sufficiently to produce moderate sweating, may be necessary; and when there is an inflammatory state or fixed soreness of any part of

the chest or lungs, the chest-wrapper should be applied. When the paroxysms of hooping-cough are very severe and suffocative, a warm water emetic is advisable; and in bad cases a tepid half-bath and foot bath should be added to the daily processes.

The allopathic treatment of cough affords a melancholy reflection for the intelligent philanthropist. How many little children are poisoned out of their constitutions by the multitudinous cough-medicines of the day! It is true the regular doctors declaim against the irregular nostrums, by which children are poisoned through the media of lozenges, medicated candies, and narcotic syrups; but unfortunately their own prescriptions are not a whit less poisonous. The most deadly drugs of the materia medica are the active principles of nearly all the popular cough remedies, and chief among them all are tartar emetic and opium; while henbane, deadly nightshade, poison hemlock, and prussic acid, are in the next highest class of *remedies!*

Dyspnœa.—The generic symptoms of this disease—the *anhelation* of Dr. Good—are: permanent difficulty of breathing, with a sense of weight in the chest. Like cough, dyspnœa is symptomatic of an extensive range of diseases.

Symptoms.—Idiopathic difficulty of breathing is distinguished into two varieties, *chronic*, and *exacerbating*—the *orthopnœa* of authors. In the former the breathing is uniformly short and heavy, and usually accompanied with a cough; in the latter it is deep, stertorous, and suffocative, subject to sudden and irregular exacerbations, and relieved by an erect position.

Diagnosis.—Dyspnœa is distinguished from asthma by the breathing being permanently yet irregularly affected; whereas in asthma the difficulty is recurrent with considerable intervals of perfect ease.

Special Causes.—Irritating dust, or pulverulent particles to which stone-hewers, glass-cutters, china-manufacturers, workers upon metals, millers, starch-makers, horn and pearl-workers, weavers, wool-carders, and feather-dressers, etc., are subject; the vapor of mineral acids, metallic exhalations, narcotic vapors, various structural derangements, as corpulency or obesity, hydatids, tumors, indurations, adhesions, etc. In some instances, a condition of *emphysema*, or preternatural dilatation of the air cells of the lungs, resulting from catarrh, has produced both dyspnœa and asthma.

Treatment.—When the cause is organic, little more can be done than to mitigate the sufferings of the patient by a careful attention to the general health. When the disease depends on functional derangement, the general management is the same as for common cough. A

moderate douche to the spinal column would be of additional service in most cases by promoting absorption; and where patients have been exposed to poisonous vapors or effluvia, moderate sweating is desirable Sauvages relates the case of a female who was bled *three times a day*, until the venesections amounted to *two thousand*, without benefit! By warm bathing and active friction, so as to produce free perspiration she was cured in ten days.

ASTHMA.—This affection is, too, much more frequently a symptomatic than an idiopathic affection. Its pathognomonic characteristics are: recurrent and temporary difficulty of breathing, accompanied with a wheezing sound, and sense of constriction in the throat, with cough and expectoration. Authors distinguish two varieties, *dry*, *convulsive*, or *nervous—asthma siccum;* and *humid*, or *common—asthma humidum.*

Symptoms.—In the *first* variety the attacks are sudden, violent, and of short duration; the sense of constriction is hard, dry, and spasmodic; cough slight, expectoration scanty, and only appearing toward the end of the paroxysm. In the *second* variety the paroxysm is gradual and protracted; the constriction heavy, laborious, and humid; cough violent; the expectoration commences early, is at first scanty and viscid, but afterward copious, and affording great relief. In many cases the attack is in the night, and most frequently an hour or two after midnight.

Special Causes.—Nearly all the causes named in the preceding disease may produce this. It is frequently caused by turgescence, or swelling of the liver or spleen, which impedes the motions of the diaphragm, or interrupts the supply of nervous influence. Strong mental emotions, repelled eruptions, suppressed discharges, rank odors, foggy, misty, or damp weather, indigestible food, and other dietetic errors, are frequent exciting causes. The predisposition is sometimes occasioned by malformation of the chest, small size of the glottis, dyspepsia, all of which may be conditions of hereditary transmission. Dr. S. Cooper names among the occasional causes, "the influence of light and darkness"—an idea altogether too diffuse.

Treatment.—Medical authors admit that asthma is seldom cured drugopathically, yet console themselves with the reflection that patients seldom die of the disease, *as such*, or until it takes some other form; hence an opportunity is afforded to *try* any kind of medication that fact or fancy can suggest. It is true that expectorants and nauseants, as squills and antimony, and relaxants and debilitants, as tobacco, coffee, gin, saltpetre, and bleeding, generally relieve the paroxysm for the time, at the expense, if frequently repeated, of the total ruin of the

digestive powers and nervous system; and that emetics, especially of lobelia, have entirely suspended the symptoms of the disease in the humid variety, for a longer or shorter period, without any great injury to the constitution; and this, I believe, is all that can be said in favor of the popular practice.

The rubbing wet-sheet, pack, and douche, with the chest-wrapper, are the leading processes. Any of the other bathing appliances may be useful or necessary in particular cases, but these are applicable and important in the great majority. When the digestive organs are strongly implicated, the tepid shallow-bath is excellent, and then the abdominal bandage may be substituted for the chest-wrapper. Asthmatic patients can usually take three or four baths daily with advantage. The following combination I have employed successfully in several cases: Dripping-sheet five minutes, followed by the douche three minutes, on rising; at ten to eleven A.M., wet-sheet pack forty-five to sixty minutes, followed by shallow-bath at 72°, ten minutes; at four P.M., sitz-bath at 65°, fifteen to twenty minutes, or *shallow* foot-bath at 65°, five to ten minutes. Where there is a good degree of animal heat, a dripping-sheet at bed-time is very serviceable. The bowels must be kept free, by tepid or cool injections, if necessary, and the patient may generally drink six or eight tumblers of water in the forepart of the day. Equally important, and perhaps more so, is the diet. Here we have another opportunity to magnify "the hunger-cure." In all cases the diet should be simple and unconcentrated, and in those cases connected with or caused by diseased livers or spleens, or primary dyspepsia, it must be rigidly abstemious; and even this should be composed principally of the articles named in a former part of this work under the head of *dry diet*, or something similar.

During the paroxysm we should palliate and abbreviate the sufferings of the patient as much as possible, by exposing him freely to the cold air—which is, indeed, what his feelings most intensely desire, and which is always safe while the fit is violent—giving him warm water to drink, even to the extent of vomition, and applying the warm half or hip-bath; or when the breathing is so laborious that he is obliged to sit erect, the hot fomentation to the chest and abdomen.

LARYNGISMUS — LARYNGISMUS STRIDULUS. — This complaint is known by the various synonyms of *spasmodic croup*, *spasmodic asthma of children*, *child-crowing*, *crowing inspiration*, *angina stridula*.

Symptoms.—The disease consists essentially of a sense of spasmodic suffocation in the larynx, which usually comes on suddenly in the night, attended with a struggle for breath, and a shrill, croaking sound of the

voice, or crowing inspiration, somewhat analogous to croup; the countenance is flushed and swollen, and in the severest cases convulsions occur. Dr. Good names "troublesome cough," as among the pathognomonic symptoms, while Hooper says it is "unattended by cough." The symptom in controversy is merely incidental. This disease sometimes, though rarely, attacks adults.

Diagnosis.—It is distinguished from croup by the attack being more sudden, and the symptoms relaxing or intermitting; the freedom of the breathing during the intervals; the absence of febrile or catarrhal symptoms; and usually the presence of hot swollen gums.

Special Causes.—Repelled eruptions, especially of the head, face, or neck; intestinal irritation from worms; indigestible aliment; enlargement of the glands of the neck and chest; cold, and teething are sometimes exciting causes. An œdematous swelling of the mucous folds in the ventricles of the larynx, has been supposed by some authors to be the proximate condition on which this affection depends.

Treatment.—The ordinary drug-treatment is, an antimonial emetic, a calomel cathartic, an opium anti-spasmodic, and a Spanish-fly vesicatory—a plan of medication far more dangerous than the disease itself. Several folds of wet-cloths well covered with dry to the throat, a tepid bath followed by the dry pack, or by putting the patient in bed, well covered so as to promote perspiration, free warm water-drinking, and a tepid injection if the bowels are not entirely free, is the plan of a safe and successful treatment.

Incubus.—Authors distinguish two varieties of incubus, one of which is called *nightmare*, and the other *daymare*. The ancient Anglo-Saxon name for this affection was *elf-squatting—elf sidenne*—so denominated because of the imaginary resemblance of the sudden sense of an oppressive and suffocative weight on the chest, to the feeling produced by some hideous monster lying on the chest.

Symptoms.—Both varieties are attended with sighing, suffocative difficulty of breathing, intercepted utterance, or entire temporary inability to speak or move, with a sensation of some external weight pressing heavily on the chest, from which the patient awakens affrighted. In the *daymare*, which occurs during wakefulness, the sense of pressure is severe, and is extended over the abdomen; the respiration is frequent, laborious, and constricted; the eyes are fixed; the sighing is deep and violent; and the intellect is undisturbed. The *nightmare* is the more common form; it occurs during sleep, which is interrupted with a violent struggle and tremor; the pressure on the chest seems to be that of some hideous monster or phantom; it is usually preceded

by a painful or troubled dream, during which the patient imagines some position of danger, as a high building, steeple, or precipice, from which he is about to fall; or fancies some horrid accident or calamity, as murder or suicide, or conceives an attack from some enemy, hag, spectre, ghost, or goblin, whose grasp he is incapable of eluding.

Special Causes.—It is generally occasioned by excessive fatigue, exhaustion from want of sleep, an overloaded stomach, or some indigestible irritant in the alimentary canal. Dyspeptics, and nervous females are very liable to it. All persons who eat heavy or late suppers are in a state of predisposition.

Treatment.—Shaking, agitating, or awakening the patient will immediately arrest the paroxysm, which, by the way, seldom lasts a full minute. The preventive management is found in a light evening meal, a hard bed, and sleeping on rather high pillows, with the body a little inclined on the side. The curative plan may be found in a daily bath, plain quality and moderate quantity of food, and a free daily action of the bowels, which should be promoted by injections if necessary.

Bronchitis.—Although this disease is attended with more or less suffocation and spasmodic respiration, it is really caused by, or rather is in fact, an inflammatory affection of the mucous membrane of the bronchial ramifications. It is frequently the precursive condition of consumption; and not unfrequently the treatment pursued by the medical man, rapidly hastens on the fatal termination, by developing tubercles in the lungs It is comparatively a modern disease, and is alarmingly on the increase, owing to the luxurious and enervating habits of fashionable society.

Authors distinguish the disease into the *acute* and the *chronic* forms; but as the former is not essentially different from a severe catarrh, or mild pneumonia, either in its symptoms, progress, or termination, it is only what is usually known as *chronic bronchitis* that concerns us here. Irritative and inflammatory affections of the mucous membrane of the throat, fauces, larynx, pharynx, and adjacent parts, are often confounded with bronchitis proper; and are described as and confounded with this disease under the various terms of *pulmonic erysipelas*, *pituitous catarrh*, *bronchial angina*, *suffocative catarrh*, *catarrhal bronchitis*, *bronchial peripneumony*, *pulmonary catarrh*, *catarrhal fever*, *acute mucous catarrh*, *acute suffocative catarrh etc.*

Symptoms.—The disease commences with more or less cough, irritation about the throat, sense of tightness in the chest, and shortness of breath, which do not, for a considerable time, attract much attention The first difficulty which is generally noticed as of importance

is a sense of roughness, with frequent attempts to clear the throat, accompanied with or followed by titillation of the larynx, exciting a dry, hard cough; these are, after a longer or shorter period, succeeded by some degree of hoarseness of voice, with a sense of tightness across the chest, and sometimes a slight pain or diffused soreness upon coughing, or inflating the lungs fully by a prolonged and deep inspiration. As the disease progresses dyspnœa comes on, which is increased by exertion, coughing, or exposure to cold, and some degree of expectoration occurs, at first scanty, then more copious and of a glairy appearance, like the white of an egg; and in still more advanced stages it becomes muco-purulent or purulent and sometimes tinged with blood. In some cases all of the symptoms are abated every summer and exacerbated every winter for several years in succession. The constitutional disturbance is marked by lassitude, pains in the limbs and back, slight shiverings or chills, frequent and feeble pulse, feverishness after dinner or toward evening, and eventually night sweats. In some cases the principal local symptoms are, hoarseness or loss of voice, a hard, dry cough, with a sense of soreness, rawness, dryness, and heat under the sternum; in most cases the cough is always excited by a full inspiration; in a few instances the breathing is rattling or wheezing, owing to the air struggling through the viscid mucus accumulations in the bronchi; and sometimes, though rarely, the voice is scarcely altered, while the breathing, on the slightest disturbing causes, becomes painfully spasmodic, in consequence of the tenacious, glaring secretion becoming concreted upon the lining membrane of the bronchial tubes.

Special Causes.—All the causes of consumption, may, under a modified set of circumstances, produce this form of pulmonary disease. But there is no doubt that the increasing quantity of tea, coffee, and tobacco consumed by our people is a special cause of the increasing prevalence of this disease among us.

Treatment.—Nearly all that has been said in relation to the management for consumptives will apply here; and to that the reader is referred. A majority of the patients come to us bundled up in flannels, extra silk, double stockings, India rubbers, and other contrivances for keeping off the cold, to which these very contrivances—usually per advice of the doctor—have rendered them extremely susceptible. All these worse than superfluities of dress must be removed by degrees, as the patient's skin becomes accustomed to the contact of cold air and water. The best processes to commence with are generally the sponge or towel-bath, or rubbing-sheet, accompanied with active though not severe friction. After a few days the chest-wrapper should be applied, and all the derivative appliances—half, hip and foot-baths—employed

as frequently and as cold as the patient can bear without disagreeable or prolonged chilliness. Precaution is necessary also, to avoid greatly disturbing the circulation or respiration, by too great a shock or too cold an impression. When the general heat of the surface is equal to, or above the natural standard, the pack should be resorted to daily, or tri-weekly. Those patients who are particularly troubled with short breath, and are easily fatigued by exercise, should walk regularly and perseveringly in the open air, within the bounds of much fatigue at first, and gradually increase the distance.

At best bronchitis is a dangerous and most obstinate disease, and patients ought to understand before commencing a course of water-treatment, that time and patience are important considerations. I have known a few cases recover in ten or twelve weeks, but a majority require careful treatment from six to twelve months, while many cases cannot be thoroughly cured in less time than from one to two years. This may seem like a long and discouraging process; but if the sufferer can draw any consolation from the fact that no other method *ever cures at all*, he will find abundant evidence of the fact if he will look over the long catalogue of remedies which are put forward in medical books; a list whose formidable length is alone conclusive that no real confidence is felt in any one of its ingredients, nor in all together.

Perhaps a page or two of this work could not be more instructively occupied than in presenting a fair sample of the interminably experimental nature of drug-treatment—as few unprofessional persons have ever dreamed of the confusion which pervades medical books on the subject of prescribing remedies. As an illustration, therefore, I will copy in full, from *one* standard work—Copland's Medical Dictionary—all and singular the remedies and curative processes, commended for the treatment of the different states, forms, stages, and complications of the disease under consideration.* These may be conveniently collated under the heads of classes, processes, fumes and fumigations, inhalations, drugs and preparations, and regimenal directions.

1. *Classes of Medicines.*—Acids, alkalies, emetics, purgatives, expectorants, laxatives, tonics, refrigerants, stimulants, antiphlogistics, demulcents, cathartics, emollients, rubefacients, mucilages, vesicatories, revulsants, counter-irritants, diaphoretics, diuretics, sedatives, bitters, alteratives, attenuants, antispasmodics, narcotics, diluents, enemata, anodynes, and narcotics.

2. *Processes of Medication.*—General bleeding by the lancet; local bleeding by leeches; topical depletion by cupping; lancing the gums (in children); blisters applied to various parts; burning the skin by hot turpentine; cauterizing the skin by moxa burnings; pustulating the skin by ointment of tartarized antimony; leeches applied over the sternum, leeches applied behind the ears; leeches applied below the occiput; cupping on the nape of the neck; issues; setons the warm-bath; sponging the body with warm water and vinegar; sponging with a warm lotion of nitro-muriatic acid; astringent gargles; cooling

gargles; antiseptic gargles; demulcent linctuses; lotions of common salt and water; semicupium, pediluvium; poultices; liniments; and fomentations.

3. *Fumes and Fumigations.*—Of tar, camphor, benzoin, amber, frankincense, myrrh, storax, cloves, sulphur, assafœtida, and various turpentines and balsams; also the smoking of balsam of tolu.

4. *Inhalations.*—Of chlorine gas; fumes of iodine; watery vapor holding in solution various narcotics; sulphuret of iodine; liquor potassii iodidi concentratus; tinctures and extracts of henbane and poison hemlock, with camphor; fumes of the various balsams, terebinthinates, and odoriferous resins; also of vinegar.

5. *Drugs and Drug preparations.*—Antimony in full doses; antimonial wine; compound powder of antimony; tartrate of antimony and potassa; solution of potassio tartrate of antimony; James' powder; blue pill; calomel; corrosive sublimate; mercury with chalk and rhubarb, followed by castor oil and small doses of ipecacuanha; Dover's powder; wine of ipecacuanha; opium; camphorated tincture of opium; syrup of poppies; camphor; camphor mixture; ammonia; carbonate of ammonia; liquor of the acetate of ammonia; conserve of roses; capsicum; olive oil; white willow bark; Iceland moss; Prussic acid; aloes; senna; crèasote; preparations of steel; carbonate of soda; bi-carbonate of soda; bi-tartrate of potash; compound tragacanth powder; sulphur; balsam of sulphur; sulphuret of potassium; sulphuric acid; sulphuret of ammonia; sulphuret of copper; sulphate of zinc; sulphate of quinine; sulphate of alumina; flowers of sulphur; sulphate of iron; various preparations of iodine; extract of dandelion; extract of hops; extract of conium; extract of hyoscyamus; extract of sarsaparilla; extract of gentian; extract of poppy; extract of lettuce; belladona; trisnitrate of bismuth; saltpetre; squills; decoction of squills; tincture of squills; infusion of squills; oxymel of squills; tincture of hyoscyamus; colchicum; infusion of colchicum seeds; digitalis; chlorate of potash; tartrate of potash; chlorate of lime; columbo; decoction of Peruvian bark; infusion of marrabium; chloride of calcium; liquorice; mezeron bark; cinchona; uva ursi; gum arabic; oil of turpentine; myrrh; vinegar; marsh mallows; decoction of polygala; linseed tea; ammoniacum; galbanum; senega; nitrous spirit of ether; kermes mineral; mixture of sweet almonds; and syrup of tolu.

Regimenal Directions.—Barley water; tamarind water; lemonade; vegetable acids; sulphureous mineral waters; Brandish's alkaline solution; ale; beer; imperial; red wines of Bordeaux and Burgundy; decoction of Iceland moss; jellies; mucilaginous and emolient soups; new-laid raw eggs; shell-fish; and white fish, dressed with olive oil, or the oil obtained by boiling their own livers.

There, reader, you have the whole apothecary shop and most of its appurtenances before you. I submit whether these *evidences* of cure do not *prove too much?*

Before dismissing this subject, I must advert to the cauterizing practice which has lately become so popular in bronchial and throat affections. Some physicians are doing an extensive business in the application of nitrate of silver to all sorts of affections of the mouth and throat; and some kind of machinery has recently been invented by which the dust of lunar caustic can be inhaled into the lungs. It is true that caustics will often cure ulcers in the mouth, or about the fauces or tonsils; but they are very liable to reappear, and, moreover, they can be better cured without the caustic than with it. But where the lungs are seriously affected, or the bronchial ramifications in a state of actual inflammation, the application of the caustic very frequently aggravates the affection of the pulmonary tissues, as I have known in

very many cases. This practice may be safe in purely local affections of the throat, but it is certainly hazardous where the lungs are also implicated.

STERNALGIA—SUFFOCATIVE BREAST-PANG.—This affection is described by various writers under the varied names of *angina pectoris*, *syncope anginosa*, *orthopnœa cardiaca*, *arthritic*, or *dolorous asthma*, and *sternocardia*.

Symptoms.—The disease is characterized by a violent pain about the sternum, or breast-bone, extending toward the arms, attended with anxiety, difficulty of breathing, and a sense of suffocation. Authors describe two varieties: *acute*, in which the attack comes on suddenly during exercise, with a tendency to faint, and which is relieved by rest; and *chronic*, in which the paroxysm is less violent, of longer duration, recurring frequently, and excited by slight causes, attended with palpitation, and not relieved by rest.

Special Causes.—Corpulent, gouty, rheumatic, and debilitated persons are especially the subjects of its attacks; hence the usual causes of obstruction and nervous exhaustion may be regarded as its predisposing influences, and, indeed, it is always symptomatic of some general morbid condition. Laennec regarded angina pectoris as a species of neuralgia of the heart; and some authors have imputed it to ossification of the coronary arteries of the heart—a supposition purely fanciful.

Treatment.—The paroxysms can be relieved by a warm water emetic, a dripping-sheet or douche, or the pouring head-bath. The cure depends on a well-regulated diet, and a daily cold-bath.

PLEURALGIA—PLEURODYNE.—Both of these terms import pain in the side, and are employed to denote a pungent pain in the side, with difficulty of breathing, which difficulty is owing to an acute distress or ache produced by every attempt to inflate the lungs. It is distinguished from pleurisy or pneumonia by being unattended with fever or inflammatory symptoms.

Symptoms.—In the *acute* or severe form, which is called *stitch in the side*, the pain is sudden and temporary, supervening on exercise, and being relieved by repose. In the *chronic* form the pain is permanent, augmented by pressure, and there is inability of lying on the side affected.

Special Causes.—The first variety is generally occasioned by hard running, jumping, lifting, or other violent exertion, but is sometimes symptomatic of flatulence, hysteria, hypochondriasis, etc. The second

rarie y is in some cases symptomatic of structural derangements, as aneurism, malformations, adhesions, or other organic lesions; more commonly it is caused by plethora, transferred gout or rheumatism, chronic inflammation of the liver or spleen; and more frequently still it is produced by the barbarous custom of lacing the chest, and the mischievous habit of leaning against a hard desk, or bending the trunk of the body forward while writing, reading, sitting, sewing, etc.

Treatment.—The *stitch* gradually subsides on moderating the exercise, or by resting. It may be promptly relieved by a handkerchief, or tight bandage, the hot fomentation, or warm douche. In the chronic form we must have regard to the producing cause, or the primary malady. The abdominal girdle is, however, always in order.

HYDROPHOBIA—CANINE MADNESS—RABIES—ENTASIA LYSSA.—Hydrophobia literally means *water-dread*, a symptom which generally, though not uniformly, attends the disease, and is, in some instances, found in other diseases.

Symptoms.—The disease generally commences with pain, uneasiness, or some unusual sensation in the wound, or bitten part, followed by pains darting along the course of the nerves. But in some few cases these local symptoms do not appear. The first constitutional symptoms are, wandering pains in different parts of the body; stiffness of the neck and throat; restlessness and irritability; the patient is drowsy or depressed; he is observed to sigh deeply and frequently; a principal feature among the early symptoms is a sudden and deep inspiration with which the patient is frequently affected. He is also severely agitated by the impression of cold air, the glare of a mirror, the noise of a pump, the sound of water, etc. As the disease progresses, its true nature becomes revealed by the difficulty of swallowing liquids, which increases until the sight or sound of water causes him to start with dread and horror; the attempt at deglutition is hurried, accompanied with sobbing, and followed by convulsions. The countenance now expresses indescribable alarm, anxiety, and suspicion; the eyebrows are contracted; the eyes are wild, staring, and glassy; there are urgent thirst, hot and dry skin, painful efforts to vomit, and intolerance to light and sound. The sufferer spits out the frothy mucus and viscid saliva between his closed teeth, with vehement strainings, which occasion a singular sound; talks in a loud, important, authoritative tone, and often screams violently. In some instances the intellect seems unaffected to the last, but in other cases he is wildly delirious, and talks incoherently and incessantly. Toward the end, convulsions become more frequent, and the patient dies asphyxiated or exhausted

The duration of the disease is usually two or three days; in some rare instances it has continued eight or nine days. The symptoms also manifest considerable diversity. Sometimes the wounded part exhibits nothing more than a slight lividity, and sometimes the cicatrix opens afresh, and oozes forth a little colored serum. In some cases the patient is furiously mad, bites himself and others, also the bedclothes, and whatever else is within reach.

Special Causes.—This disease is usually communicated by the bite of a rabid animal; but it may originate spontaneously. The nature and origin of the virus, or infecting principle, are unknown. But that putrid flesh and decomposing offal, on which so many dogs, cats, hogs, etc., are fed, are the chief producing causes, is attested by the frequency of its occurrence in those animals. But this cause alone does not seem capable of generating the poison. Some excitement, or feverish heat of the blood, must co-operate. It is well known that violent passions have, in the human being, and in various domestic animals, changed the saliva in a moment to an absolute virus, which has communicated disease and death to others. Thus the bite of an enraged man, horse, hog, goose, duck, and hen, has been known to impart a deathful infection. And when a furious exercise of the passions, or an inflammatory state of the blood by violent exercise, co-operates with putrescent food, the peculiar abnormal transformation of matter may take place, which, analogous to a ferment, as I have previously had occasion to intimate, may produce in the saliva a virus capable of propagating itself under favorable circumstances. This view is corroborated by all its historical and phenomenal data. Dogs, cats, and hogs are most exposed to these combined influences, and these animals are most subject to the disease, and in the order named. Wolves and foxes have been noticed as more frequently affected than the herbivora —horses, oxen, cows, sheep, goats, etc., and the manner in which they are exercised and fed, still strengthens our position.

Prognosis.—Hooper pronounces judgment in the following words: "Fatal. The disease has hitherto defied all remedies." Some few cases, however, have recovered under different and even opposite plans of treatment, owing probably to the enduring energies of a good constitution. Water-treatment has apparently succeeded in two or three instances.

Latent Period.—The time which elapses between the bite of the rabid animal and the development of the symptoms, is usually from twenty to forty days; but it may be less than a week, and has been known to extend to three and four years.

Treatment.—The indications are—1. To equalize the distribution of

nervous influence; 2. To deterge the system of its virus. In the early stages the cold treatment may be applied in almost any form, provided it be powerful enough to produce a decided sedative influence upon the whole system, followed by the wet-sheet or dry blanket enveloping, to promote perspiration. Probably the preferable processes are the douche and rubbing-sheet, followed by the wet-sheet pack when the temperature of the body is nearly at or above the normal standard, and by the dry pack when the circulation is low, and there is an inclination to chilliness. These processes may be repeated and alternated as long as the spasmodic condition of the throat exists. Meanwhile, if the patient cannot swallow sips of cold water, he may perhaps be able to chew or swallow bits of ice; and he may be indulged to the extent of his inclination. Very cold compresses or powdered ice should also be applied to the thorax. Very cold water enemas I should decidedly recommend, although I am not aware that they have ever been tried. Hooper tells us that the irritation of the throat has never been removed except by the use of ice taken internally.

Priessnitz has repeatedly cured rabid dogs by douching them perseveringly in cold water. The following case, treated by Dr. Todd, at King's College Hospital, is instructive: The patient was a boy seven years of age, laboring under the worst form of the malady, and refusing, with horror and impatience, every thing offered him, of either a solid or liquid form. After having taken twenty drop doses of prussic acid without any effect on the spasms, he was offered a fragment of rough ice, which he seized and swallowed with avidity. Fresh pieces were constantly put into his mouth, which he seized and craunched between his teeth with remarkable eagerness, swallowing them with perfect ease. In half an hour he had taken a pound and a half of rough ice; and at the same time a bladder containing a mixture of roughly-powdered ice and common salt was applied the whole length of the spine and around the throat. Under this treatment all the symptoms referable to the throat and chest, with the exception of occasional hackings, passed away, and nothing remained but extreme restlessness, violent excitement, and incoherence. In this condition, and in Dr. Todd's absence, the *cold douche* was unfortunately applied by the directions of some other physicians, "but the system," says the physician who prescribed the douche, "did not rally from the shock."

Dr. Guy, author of a work on Medical Jurisprudence, remarks, in relation to the above case: "I am inclined to attribute more benefit to the internal than to the external use of ice in this case; but the joint administration seems to be the most rational treatment yet recommended."

There was certainly a grave mistake in the application of the *cold* douche under the circumstances. On the first attack it would have been proper, but when the violent symptoms are subdued by cold treatment, and the patient is in a state of partial collapse, a very *cold shock* is entirely out of place. But there is another very important consideration. The patient had taken enormous quantities of a powerful narcotic, and, although he did not manifest any symptoms of narcosis while the convulsive paroxysms continued, yet the deadly drug was in him, and must have so paralyzed the nervous system that it could not possibly react or rally against such a shock, which, in an earlier stage, or without the prussic acid, might have been harmless and salutary. Patients will, in no diseases, and under no circumstances, bear *cold shocks* as well while under the influence of narcotics; a fact I have repeatedly known to be verified in actual practice. The history before us shows also the danger of occupying the system, and prostrating its energies by a drug-poison, while we are making impressions on the system by another and very different set of agencies. They do not work well together.

The cold water-treatment was in repute for hydrophobia even in the days of Celsus; and Dr. Good, who, after an elaborate examination of all the methods of treatment known to, or rather practiced by modern physicians, confesses the utter inutility of all of them, adverts to the case of a patient who was cured by water, as though it was a wonderful escape from death by drowning. "Thus," says Dr. Good, "M. Morin relates the case of a young woman, twenty years of age, who, laboring under symptoms of hydrophobia, was plunged into a tub of water with a bushel of salt dissolved in it, and was *harassed* with repeated dippings until she became insensible, and was at the *point of death*, when she was still left in the tub, sitting against its sides. In this state, we are told, she was at length *fortunate enough to recover her senses*, when, much to her own astonishment, as well as to that of the bystanders, she found herself capable of looking at the water, and even of drinking it without choking."

The preventive treatment after the bite, as in all cases of poisoned wounds, is by excision of the part, if it can be done instantaneously; the ligature; cauterization; suction; and perhaps refrigeration. Probably the immediate application of a ligature above the bitten part, and the employment of a powerful cupping-glass over the wound, would arrest the process of absorption for an hour or two, after which excision or cauterization may be resorted to, or both. In all cases, it would be a prudential measure, after the wound has been attended to, to undergo a thorough course of wet-sheet packings, with the view of cleansing

the body as much as possible from all morbid secretions or putrescent accumulations upon which the virus could, as it were, feed and propagate itself, should any portion of it happen to pass into the circulation.

Acrotismus.—The affection called *acrotism*, *pulselessness*, and by some *asphyxia*, though improperly, is a failure or cessation of pulsation for a longer or shorter period, sometimes affecting only particular parts of the system, and sometimes extending over the whole body, often accompanied with paleness, chilliness, pain in the epigastrium, and a sense of spasmodic constriction in the respiratory muscles.

It is often precursive of palsy and apoplexy, sometimes symptomatic of organic derangements; but is sometimes produced by functional derangement of the stomach, liver, or spleen, or some obstruction to the equable radiation of the nervous energy. Some persons have possessed the ability to produce, by voluntary effort, a universal deficiency of pulsation, and of simulating natural death.

Treatment.—The paroxysm may be relieved by thorough friction with cold wet cloths, followed by dry flannel or the dry hand; the cure, so far as practicable, depends on a strict compliance with all the laws of hygiene.

Tetanus.—Several forms in which this disease presents itself, have been designated as varieties by many authors; as *emprosthotonos*, when the body is bent rigidly forward; *pleurosthotonos*, when it is rigidly bent laterally; *episthotonos*, when rigidly bent backward; *erectus*, when rigidly erect, etc.

Symptoms.—The character of the disease is a permanent and rigid contraction of many or of all the voluntary muscles, with incurvation of the body, and difficulty of breathing. Generally the extremities are firmly extended, the abdominal muscles strongly retracted, the eyes fixed, the forehead drawn up into furrows, and the whole countenance is shockingly distorted; the violent contractions are attended with excruciating pain; the pulse is accelerated; the respiration is very laborious, or almost suspended; and the skin is covered with a profuse perspiration. The symptoms frequently remit partially, but are renewed with aggravated torture by the slightest cause, as the least motion of the patient or slightest touch of an attendant. Sometimes the tongue is darted spasmodically out of the mouth, and the teeth, spasmodically snapping upon it, lacerate it severely, unless prevented by some intervening substance. In fatal cases, death is preceded by frothy or bloody mucus at the mouth, small and imperceptible pulse, and delirium.

Special Causes.—Sudden exposure to damp and cold when the body is overheated; wounds, punctures, lacerations, or other local irritations of nerves; the bad air of crowded hospitals; extreme terror, or violent passion; sympathy; long exposure to a very hot sun; various narcotics, as strychnine, or nux vomica; intense galvanic excitement. Hooper names, among the predisposing causes, "the male sex, robust and vigorous constitutions, warm climates, the period of infancy!" It is a singular reflection on nature, or on nature's God, that one cannot be a male, nor have a good constitution, nor live in a warm climate, nor exist during infancy, without being, from either of these circumstances, predisposed to tetanus.

Duration.—In fatal cases the ordinary duration is from four to eight days. Favorable cases linger from one to eight or ten weeks.

Prognosis.—When arising from wounds, the disease has in most cases proved fatal, and it is exceedingly dangerous when existing from any cause.

Treatment.—Water-Cure has not yet been fairly tested in this formidable affection, but the principle upon which the treatment should be regulated, seems very clear. The single indication is to abate the irritation; and to do this the leading measures must be calculated to produce and maintain a relaxant or sedative effect. Horses, and even wounded soldiers, have been cured by an accidental exposure to a long and drenching rain; from which fact we may derive a profitable hint. As the patient is excessively susceptible to impressions of all kinds, it would not answer to weaken him with very warm water, nor shock him with very cold. The wet-sheet envelop—and two or three thicknesses, are better than one, especially in the early stage, if the patient has taken little or no narcotic or depleting remedies—offers the best resource. As soon as the patient is comfortably warm, a part of the bedding should be removed or the bed-clothes loosed, so as to keep up a comfortable glow and maintain a moist state of skin for a long time, even hours together. When the patient becomes too warm, or the wrapping-sheet too dry, it should be wet with cool or tepid water, 65° to 75°, without being removed, so that the patient may continue at perfect rest. There can be no danger in continuing this treatment for days, provided the temperature of the patient is carefully kept near the natural standard. When caused by a wound, the injured part should be covered with several folds of cold wet cloths—as cold as can be borne, without increasing the pain, which should be frequently changed. If able to swallow, the patient should drink rather freely, and as much cold water should be occasionally thrown into the bowels by a pump-syringe as they can conveniently receive

Locked-Jaw—Trismus.—This disease differs from the former in the spastic rigidity of the muscles being chiefly confined to the lower jaw; from which circumstance many authors regard it as a mere form or variety of tetanus. It has also been designated as *traumatic*, when arising from wounds, surgical operations, or other local injuries; and *catarrhal*, when produced by colds. Sometimes it attacks infants soon after birth, constituting the *trismus nascentium* of Dr. Good.

Symptoms.—Sometimes the attack is sudden, but usually the symptoms come on gradually; there is more or less of an uneasy sensation at the root of the tongue, and some degree of difficulty of swallowing. The spasms sometimes extend to the muscles of the chest or back; the breathing is nasal; articulation is interrupted and slow; the muscles of the nose, lips, mouth, and of the whole face are fixed and distorted, and the jaw bone is often so firmly set as to break before the muscles will yield to mechanical force.

Special Causes.—Mechanical injuries, especially the wounding of nerves in bleeding and surgical operations; gun-shot wounds, punctured wounds by nails, splinters, pieces of glass; extreme vicissitudes of temperature, etc. Obstructed bowels is a frequent cause of the infantile variety.

Treatment.—The general plan of medication is similar to that of the former variety. Derivative baths may be here employed, in addition, with advantage, of which the tepid shallow-bath, accompanied with active hand-rubbing, is the best. The bowels should be freely moved by warm water injections.

Cramp.—This affection is often symptomatic, as in various species of colic, cholera, and other diseases. Pregnant women, whose habits are too sedentary, or whose diet is too concentrated, are often troubled with fugitive cramps about the hips or in the muscles of the lower extremities.

Symptoms.—The disease consists of a sudden contraction and convolution of one or more muscles, attended with extreme but temporary pain. The stomach, neck, calves of the legs, and toes, are the parts most frequently attacked. When the hollow viscera or membranous muscles are affected, the pain is agonizing, a violent perspiration usually breaks out, and the part feels as though it were puckered and drawn to a point. When the stomach is attacked, the breathing is short and distressing.

Special Causes.—Sudden exposure to cold or damp when the body is relaxed; flatulence of the stomach or bowels; long-continued pressure; overstretching the muscles Acrid bile is a frequent cause of

cramp in the stomach, and acrid drugs are a common cause of acrid bile; hence we meet with the most obstinate cases among obstinate drug-takers.

Treatment.—The paroxysm can be relieved in a variety of ways. The warm douche, followed by the cold dash; hot fomentations; the warm hip-bath and foot-bath are applicable to cramp in the stomach; when seated in the external muscles or extremities, the hot or cold douche will each relieve it; it can also be speedily overcome by forcibly pressing the affected muscle against a hard, resisting body, as, for example, the ball of the toe, or the heel against the floor, foot-board or upon the other foot. The *cramping diathesis* may be entirely eradicated by daily bathing, plain, unconcentrated food, and regular and active exercise.

Muscular Distortion of the Spine—Spinal Incurvation.—"Spinal disease," "spinal weakness," "spinal irritation," etc., are among the rapidly-increasing diseases which tell of our enervating habits and consequent physiological degeneracy Spinal distortions may result from organic affections—caries or injuries—of the vertebral column, or from osseous malformation, as in rickets and scrofula; but the great majority owe their existence to simple muscular debility.

There is no part of the great field of "medical science" in which a more blundering pathology, a more unfortunate diagnosis, and a more empirical practice prevail than that relating to spinal complaints. All through the country weakly females abound, whose backs have been blistered, burned, scarred, cauterized, leeched, cupped, scarified, pustulated, and otherwise tortured, with the view of *counter-irritating* a spinal disease, when in fact they have had no spinal disease at all! Any form of indigestion, any morbid condition of the liver, kidneys, and any form of mismenstruation, may produce a sympathetic irritation of some portion of the spinal column; and in many of these diseases of the abdominal and pelvic viscera, a tenderness will be found by pressing firmly on that part of the spine from which the nerves are sent off to the organ or part really diseased. This symptomatic tenderness the doctor mistakes for an idiopathic disease, and plies his destructives accordingly. Again, when the whole body is debilitated by fine food, hot drinks, close rooms, sedentary habits, etc., the whole muscular system is necessarily relaxed; it has not sufficient firmness and elasticity to sustain the trunk of the body erect, and perform its varied motions with ease and energy; hence, like the masts of a ship, when the ropes are weakened or destroyed, the vertebral column bends, leans, or tips backward, forward, or to one side—usually the latter; and again the med-

ical man, again misapprehending the state of affairs, instead of attending to the health in general, and strengthening the weak muscles in particular, administers his internal drugs and drastics, and puts on his external liniments and plasters, or endeavors to give support to the falling frame by binding it up with a set of awkward and complicated machinery. Thousands of females have had real diseases inflicted upon them by the physician's attempts to cure the imaginary one.

The "small of the back" is the center of the whole muscular system; it is the strong or weak point with every person, and no less than three hundred distinct muscles are concerned in the complicated movements of the vertebral column; hence it is not difficult to understand how a relaxed or weakly condition of the general system should be especially manifested in a muscular distortion of the spine.

Special Causes.—Under this head I am most happy to quote the following sensible observations from a standard allopathic book, more especially as I have so frequent occasion to dissent from the sense expressed in the works of that school.

"In rustic life we have health and vigor, and a pretty free use of the limbs and the muscles, because all are left to the impulse of the moment to be exercised without restraint. The country girl rests when she is tired, and in whatever position she chooses or finds easiest, and walks, hops, or runs, as her fancy may direct, when she has recovered herself; she bends her body and erects it as she lists, and the flexor and extensor muscles are called into equal and harmonious play. But instead of this, let the child of the opulent be compelled to sit bolt upright in a high, narrow chair with a straight back, that hardly allows of any flexion to the sitting muscles, or of any recurvation to the spine; and let the whole of her exercise be, instead of irregular play and frolic gayety, be limited to the staid and measured march of Melancholy in the Penseroso of Milton:

"'With even step and musing gait;'

to be regularly performed for an hour or two every day, and to constitute the whole of her corporeal relaxation from month to month, girded moreover, all the while, with the paraphernalia of braces, bodices, stays, and a spiked collar, and there can be no doubt that the young heiress will exhibit a shape as fine and a demeanor as elegant as *fashion* can communicate, but at the heavy expense of a languor and relaxation of fiber that no stays or props can compensate, and no improvement in figure can atone for."

Diagnosis.—In organic or structural derangements, the distortion is from within outward, forming a sharp projection of the bones, called

angular curvature, in contradistinction to the disease before us, which is usually termed the *lateral curvature;* and this may be *right* or *left*, as the muscles on the right or left side of the body are more debilitated from peculiar personal habits, ordinary bodily positions, etc. The muscles of the back are more or less emaciated; the soreness or tenderness upon pressure is a very variable symptom; it may be constant or occasional, severe or slight, or entirely absent. Paralysis of the lower extremities is a common symptom of the organic or true spinal disease, especially when the displaced vertebræ press severely on the spinal cord, and when any portion of the cord or medulla oblongata is affected with a softening *ramollissement*—or other abnormal transformation. Some authors have imputed the lateral or muscular curvature to an *over-action* of some of the muscles of one side; but the exact contrary—want of action—is invariably the fact. Some authors regard the muscular distortion as the predisposing cause of the bony distortion; while others regard the disease of the bones and a relaxation of their ligaments as the producing cause of the muscular depressions. Neither hypothesis is correct; for both affections, as already intimated, commence progress, and terminate independently of each other: one being strictly organic, and primarily affecting the bones; the other purely functional, and primarily seated in the muscles. Sometimes the miscurvation is double, forming a sigmoid flexure; and the contortion is said to be more frequently on the right side than on the left, probably owing to the more frequent extension of the right hand, the body being thrown toward the left to preserve the central point of gravitation.

Treatment.—First of all in importance is the general regimen. All superfluous clothing must be thrown off; silks and flannels next the skin must be eschewed; all artificial support must be withdrawn, and every thing about the body or dress which interrupts in the least free and varied motion is to be removed. Exercise in the open air should be frequently taken, and such gymnastics as call the muscles more especially debilitated into action, should be indulged with moderation, and regularly persisted in. The bed should be easy but not heating. A good hair mattrass answers very well, and a bed well filled with new oat straw is still better; the patient, during sleep, should recline as nearly on the horizontal posture as is consistent with quiet rest, but not put on an uncomfortable stretch, as some authors have advised. The dietetic plan should consist, to a large extent, of plain, unmixed, solid and dry articles and preparations, as brown bread, with baked apples; wheaten grits and sugar, with uncooked apples; wheat meal or Indian cakes, with milk; roasted potatoes and milk, with dry crusts of good

sweet bread; Graham crackers, with ordinary vegetables and fruits, etc. Cold water should be drank in the forepart of the day, especially soon after rising, as freely as the stomach will bear without decided discomfort; and if the bowels are in any degree torpid, a daily injection should be employed.

The bathing part of the treatment should be as strictly tonic as possible. The dripping-sheet, followed by active and prolonged rubbing with the dry hand; or the tepid shallow-bath, followed by the pail douche, and this, succeeded by hand friction, should be employed daily when practicable, and the towel-wash substituted when both are impracticable. The douche to the whole surface of the back may be employed once or twice daily. The stream should be of moderate force, and applied from two to five minutes. The hip-bath will also be highly serviceable, by constringing the relaxed muscles at the very point of their greatest relaxation. The air-bath is also worth recommending in this place, and its advantage would be greatly enhanced by manipulating or shampooing the whole back, and especially in the immediate vicinity of the morbid curvature.

I may add, in conclusion, that Dr. Jarrold, who once wrote an elaborate treatise on this complaint, limited his medication almost exclusively to burned sponge and the carbonate of soda, from which treatment he is said to have experienced remarkable success; but it is worthy of note that his *hygienic auxiliaries* were, a *recumbent posture*, *shampooing*, *friction*, *pure air*, occasional exercise, and careful attention to *diet*. I am of opinion his hygiene effected the cure, while the drugs were useless or nearly insignificant.

Muscular Stiff Joint.—This affection, which consists of a permanent and rigid contraction of one or more articular muscles or their tendons, may arise from spasmodic contraction or from simple atony: the former kind often results from rheumatism, and the latter from long confinement or neglect of use; colds, strains, and inflammations occasionally produce it. The douche, compresses, active and prolonged friction with soft flannel or silk, or, better still, the bare warm hand, are the "*methodus medendi*."

Wry Neck.—A permanent contraction of the flexor muscles of one side of the neck, or a loss of the balance of action between the flexors and extensors, by which the head is drawn obliquely to the right or left, may be occasioned by a natural disparity in the length of the opposite muscles, and only curable, if at all, by a surgical operation, or by a spasmodic fixation of one or more muscles on the contracted side

or from debility of the muscles on the opposite or yielding side; or from the two last conditions combined. The first variety is generally congenital, but sometimes results from burns and other injuries; colds and strains are the usual causes of the last three varieties, the curative method for which is the same as for the preceding disease.

Hiccough—Hiccup—Singultus.—The disease before us, and all others arranged under the head of *chronic spasm*, are frequently symptomatic affections. In rare instances, however, they seem to occur idiopathically; that is to say, without any other apparent and well-defined primary malady to which they can be imputed.

Symptoms.—Hiccough is defined, a convulsive catch of the respiratory muscles, with sonorous inspiration, iterated at short intervals. The spasmodic action, as in the case of vomiting, is principally made by the diaphragm and external abdominal muscles.

Special Causes.—Bile in the stomach, acidity, flatulence, indigestible food, an overloaded stomach, external pressure, narcotics, intoxicating drinks.

Treatment.—A draught of cold water, the foot-bath, cold compresses to the stomach. When occasioned by acrid bile, over-fullness of the stomach, or alcoholic liquors, warm water-drinking, the cold abdominal bandage, and the cold injection.

When the spasmodic action appears to be merely irritative, it can be checked at once by holding the breath as long as possible, and fixing the mind intently on some object; violent sneezing, sudden fright, or almost any sudden and strong emotion of mind, will generally arrest it. Baron Dupuytren once cured an obstinate case by applying a hot iron to the region of the diaphragm; but whether the actual cautery or the actual fright actually cured the patient, medical gentlemen may differ; my opinion is in favor of the fright.

Sneezing—Clonus Sternutatio.—Sneezing is a convulsive motion of the respiratory muscles, by which air is driven violently and suddenly through the nostrils, producing a sonorous expiration. In the natural order of things the act is intended to eject from the mucous membrane of the nostrils any irritant or offensive material which effects a lodgment there. Snuff-takers frequently so obstruct and paralyze the nervous sensibility, that it is impossible to excite sneezing by all the pulvurulent narcotic the nose is able to receive; while the undepraved instinct will raise a violent commotion against the smallest particle of obnoxious dust or mephitic vapor.

Special Causes.—Pungent dust, vapors, gases, or other local irri-

tants; indurated mucous and acrimonious secretions, as in catarrh and measles; morbid sensibility of the Schneiderian membrane from acrid bile, and morbid secretions of the alimentary canal.

Treatment.—Sniffing cool or cold water frequently, taking care to draw the fluid into the nostril by means of a moderate but prolonged inspiration, rather than by a forcible, jerking motion; in severe cases, derivative baths—the hip and foot—are useful; and in some cases of dyspeptic sneezing, the whole face requires "packing." I once had an inveterate dyspeptic under treatment, who was afflicted with an eruptive, erythmatic, or "cankerous" condition of the mouth, throat, stomach, and bowels; and this occasioned such an excessively irritable state of the mucous membrane of the nose that the most trivial exciting causes would excite violent and painful attacks of sneezing; these would continue, unless attended to, for hours, and until the whole face was greatly swollen, the eyes injected and tearful, and the sense of tickling and irritation incessantly annoying and intolerably distressing. The sneezing fit was several times stopped by placing several folds of wet cloths over the whole face, leaving a small aperture for breathing purposes, and covering these with dry flannel, so as to produce what has been called the "poultice" effect of the wet compress.

PALPITATION.—A subsultory vibrative motion may be limited to the heart alone, or the trunks of some of the larger arteries alone, or affect their ramifications in the viscera, constituting palpitation of the heart, of the arteries, and complicated or visceral palpitation.

Symptoms.—Palpitation of the heart is a vibratory and irregular action, sometimes sharp and strong, and then called *throbbing of the heart*, and sometimes soft and feeble, when it is termed *fluttering of the heart*. In some instances the force of the heart's contraction has been so great as to shake the bed, be heard across the room, rupture the ventricles, and even fracture the ribs. In very nervous or irritable persons the palpitation often shoots from one artery to another, and sometimes a preternatural pulsation pervades every part of the body, the morbid sensibility being so acute that the patient not only feels the universal throbbing, but actually hears it. The temporal and carotid arteries are particularly subject to a migratory throbbing, which may be synchronous, or alternating with the beating of the heart. In dyspeptics, the descending aorta is often the seat of a most disagreeable throbbing, not unfrequently mistaken for aneurism.

Special Causes.—Palpitation is always symptomatic of some organic or functional difficulty, commonly the latter. All visceral obstructions, and every form of indigestion, are liable to be attended with this symp

tom. The use of tobacco, strong coffee, green tea, or ardent spirits very frequently produces the worst and most obstinate attacks. Strong mental emotions, if frequently repeated, or continuous mental excitements of any kind, tend to create a habitual, disorderly action of the heart and arteries. Probably constipation of the bowels is the cause of the most violent attacks on record. The most common structural derangements of which palpitation is symptomatic, are enlargement or induration of the heart; aneurismal dilatation of its cavities; ossification of its valves, or its connection with the aorta; morbid accumulation of fat around the pericardium; dropsical collections within the pericardium; adhesions of the pericardium.

Diagnosis.—It is often extremely difficult to distinguish between functional and structural causes of palpitation. The following will serve as a general though not a universal rule: functional palpitations are *intermittent*, while those produced by organic affections are *continuous*; and to this I may add, that in all abnormal pulsations from functional derangement or nervous irritability, the character of the pulse is exceeding variable; while in organic affections its abnormal character whatever that character may be, is nearly uniform. It may afford some consolation for invalids with this affliction to know that not more than one in ten of those who are suspected, by themselves or by their physicians, of an organic cause, ever find more than a functional derangement.

Treatment.—As the disease is merely secondary, all we have to do is to trace it to the primary malady, and treat that according to its character.

Nictitation.—A rapid and vibratory motion, or *twinkling* of the eyelids is named as a distinct disease by some authors. When the eye has been frequently exposed to dust, or pungent gases, vapors, etc., a morbid sensibility sometimes remains after the cause of irritation has been removed, producing an irregular, convulsive, and unsightly winking. It has been overcome by a powerful exertion of the will, and by employing only one eye at a time. Frequent cold bathing, followed by gentle manipulation, seems well adapted to restore the natural tone.

Subsultus.—Sudden and irregular twitches or snatchings of the tendinous extremities, are generally indicative of extreme debility, and are hence common in low fevers, and the latter stages of many fatal disorders. But sometimes a feeble convulsive action is local and habitual. Nervous and irritable persons, of otherwise fair health, sometimes are troubled with a jerking, spasmodic action of the muscles of

the shoulders, hands, feet, etc. Such cases almost always depend on some obstruction of the skin, or bowels, or both, and are curable by a daily bath, coarse opening food, and cool injections.

STRETCHING—PANDICULATION.—It requires some stretch of imagination to regard what Dr. Good defines "transient elongation of the extensor muscles, usually with deep inspiration and a sense of lassitude," as a distinct disease. *Yawning*, *gaping*, and *stretching* are instinctive efforts to recover the balance between the flexor and extensor muscles; and are sometimes excited by misposition, and at others by certain morbid conditions, as nausea, the shivering stage of fever and ague. Most frequently, however, that kind of stretching which authors have dignified with the title of a malady, under the name of pandiculation, is symptomatic of indolence; hence it is rather peculiar to loungers, who "cannot rise from the sofa without stretching their limbs, nor open their mouths to answer a plain question without gaping in one's face." The remedy is *occupation*.

CHAPTER XI.

DISEASES OF GENERAL TORPITUDE

THE diseases constituting the present chapter, are distinguished by general muscular immobility, with mental or bodily stupor. They form a striking contrast with those of the preceding chapter, and embrace the following species:

Asphyxia—Suspended Animation
Ecstasy—Spurious Catalepsy.
Catalepsy—Trance.
Lethargy—Deep Sleep.
Apoplexy.
Palsy { Hemiphlegia, Paraplegia, Particular.

ASPHYXIA—SUSPENDED ANIMATION—APPARENT DEATH.—The term *asphyxia*, or asphyxy, is often used in the limited sense of *acrotism* or pulselessness, and is generally restricted to that suspension of all the powers of sensation and voluntary motion which is immediately owing to non-arterialization of the blood from interrupted respiration

But in a more comprehensive sense it has been, and in the present sense is employed to denote all cases in which a total or partial suspension of the mental and corporeal functions characterizes the access of the disease.

Symptoms.—These vary with the producing cause. In asphyxia from *suffocation*, as in hanging or drowning, the countenance is turgid, and suffused with livid blood; the eyeballs are protruded,

> "Staring full ghastly, like a strangled man;
> His hair upreared, his nostrils stretched with struggling."

When the asphyxia is produced by inhaling carbonic acid—*choke-damp*—or other irrespirable gas or mephitic exhalation, the countenance is pallid, the whole surface is also pale, and death often takes place instantly, save when the deleterious aura is largely diluted with common air, in which case the symptoms more or less resemble apoplexy. Of the gases positively pernicious to breathe, are the carbonic acid, often found in close rooms where charcoal has been burned, in the bottom of wells, or large beer-casks, and in natural caverns; the carburetted hydrogen, and various compound gaseous products evolved from decomposing animal and vegetable substances, and from the putrefying corpses of cemeteries; and of the negatively injurious gases—those which do not support respiration—are hydrogen and nitrogen; some of their compounds, however, with sulphur, carbon, and phosphorus, are absolutely destructive. The fumes of mercury, lead, and various other metallic substances, when highly concentrated, operate with as sudden fatality as the fumes of charcoal.

In electrical asphyxia, which is produced by a stroke of electricity or lightning, the limbs are generally flexible, the countenance is pale, and the blood is incoagulable; usually the limbs do not stiffen after death, and the body becomes rapidly putrescent. Sometimes no external injury whatever is observable; but in other cases the skin is vesicated, the hair is scorched, and the body more or less lacerated and torn.

When the disease results from intense cold—frost-bitten asphyxia—the limbs are rigid, the countenance pale and shrivelled; it comes on more gradually than the other forms; there is a tendency to sleep, which increases as the period of exposure is extended; and when this is joined with fatigue, the torpor and drowsiness often become irresistible.

Various narcotic poisons, as cicuta, tobacco, and Prussic acid, when taken in large quantities, and also the *anæsthetic* agents, as ether and chloroform, in extreme doses, will produce asphyxia, attended with total insensibility and universal muscular relaxation.

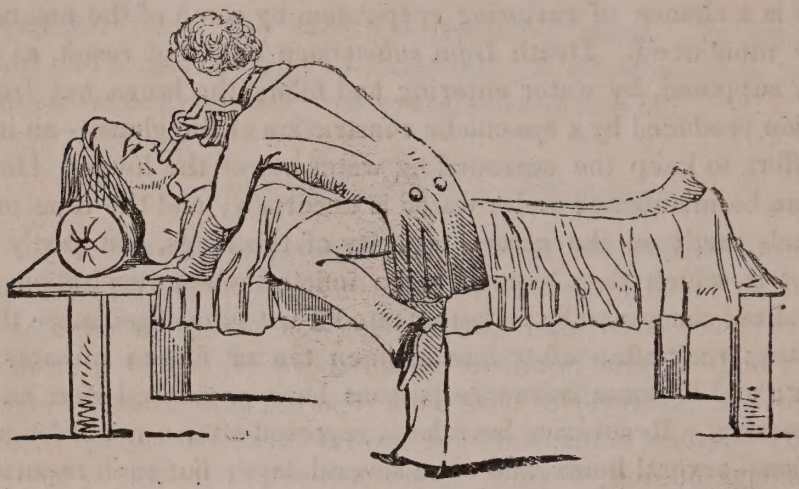
Treatment.—This must vary with the cause. The variety produced by *hanging* is hardly a medicable case; yet if the strangulation has not continued too long, nor the neck-joint been fractured or dislocated, there is a chance of restoring respiration by some of the means about to be mentioned. Death from *submersion* does not result, as is generally supposed, by water entering and filling the lungs, but from suffocation produced by a spasmodic constriction of the glottis—an instinctive effort to keep the surrounding water out of the lungs. How long life can be maintained under water is uncertain; and the time probably depends partly on the natural capacity of the lungs, and partly on the extent to which they happen to be inflated when respiration ceases. Individuals can generally be resuscitated if not submerged more than five minutes; very often after having been ten or fifteen minutes under water; and in some instances persons have recovered after an hour's submersion. Recoveries have been reported after a much longer submersion—several hours, and even several days; but such reports seem to challenge human credulity rather severely. Be this as it may, our duty is plain; it is to endeavor to resuscitate the patient so long as there are the least indications of a spark of remaining vitality. Instances are well authenticated of patients having recovered after a perseverance in the restorative means for eight or ten hours.

The remedial plan comprises two distinct indications: 1. To restore warmth and circulation to the surface. 2. To inflate the lungs. In the first place, the patient should be wiped dry, wrapped in clean warm blankets, and conveyed in a recumbent posture on the back, with the head and breast raised, to a warm, dry, well-ventilated room, and surrounded by no persons except the necessary attendants. Dry warm flannels, and bottles or bladders of warm water, or bags of warm grain or sand, are to be applied to the stomach, feet, and sides, and the surface should be thoroughly and perseveringly rubbed by the warm dry hands of the attendants. The mouth and nose should be promptly cleansed of the obstructing mucus, and the foul air may be sucked out by means of a tube, which may also be used for inflating the lungs, as in figure 187.

The inflation of the lungs is the most important of all the curative processes. This may be done by repeatedly forcing into the patient's mouth—the nostrils, meanwhile, being held close—a full expiration of air from the lips of an attendant, or by means of the tube represented in figure 187, alternating the expiration with moderate but firm pressure on the external abdominal muscles, so as to simulate all the motions of natural respiration. A common bellows, when well managed, is preferable, because it will convey pure, unrespired air to

the lungs; and if the bellows can be attached to a tube, and this introduced into the larynx, the effect will be better still.

Fig. 187.



INFLATING THE LUNGS.

It may excite the surprise of the non-professional reader to be told that *bleeding*, even in the asphyxiated state, is an approved allopathic *remedy* in this disease. Many physicians of "high authority" recommend opening the jugular; while other high authorities oppose the practice, not on the ground of its impropriety, but because the blood will seldom flow if the jugular is opened. Samuel Cooper dissents in part. He says: "Bleeding ought never to be employed *in this stage* of the process, though it may become necessary when the circulation has returned, and reaction has taken place." This means, liberally interpreted, that after the patient is out of danger it will not kill him to lose a little blood, although it might have been the death of him while the danger existed!

When the disease is caused by deleterious gases, narcotic or metallic fumes, etc., or the anæsthetic agents, the treatment chiefly consists in exposing the patient freely to the open air, dashing cold water in the face, pouring cold water over the head, and active friction with pulmonary inflation, as in the preceding variety. Injections of cold water are also serviceable; sprinkling or dashing cold water over the surface, following the application with active friction with the bare hand, has been tried with evident advantage.

In the case of apparent death from electricity, all the appliances just named may be called in requisition; but as far as experience can guide us, dashing cold water freely over the breast, face, and even the whole body, and the prolonged pouring bath to the head, are the most important processes

Here again, many of the shining lights of allopathy insist that the patient ought to lose a little of his blood, as well as all of his sensibility. M. Portal recommends opening the external jugular; Dr. Doane thinks the abstraction of a few ounces has done good; and Dr. A. H. Stevens, of this city, has recorded a case of injury by lightning *successfully treated by copious venesection;* that is to say, the amount of blood drawn within *ten days* was about one hundred and twenty ounces! If a patient can survive a stroke of lightning long enough to go through a ten days course of venesection, it is conclusive evidence that he can live better without the remedy than with it. Dr. Stevens has afforded another demonstration of the old proverb, that many patients recover in *spite* of the disease and the doctor.

In asphyxia from cold, the application of warmth must be cautiously managed. When a limb or part is frozen, the coldest water should be employed in the first instance, and the temperature gradually raised; the patient, meanwhile, should be kept in a moderately cool atmosphere until the circulation is restored. Rubbing the frost-bitten part with snow until sensibility returns, and then with warm water, and afterward the dry hand, is an excellent plan. In cases of extreme torpor from cold when no part is absolutely frozen, friction with wool, flannel or the dry hand is appropriate.

Ecstasy.—This affection is peculiar to those states of bodily derangement of which mental aberrations or extravagances are symptomatic; hence it attacks chiefly melancholic, hypochondriac, visionary, and abstracted persons.

Symptoms.—The paroxysm consists of a sudden and total suspension of sensibility and voluntary motion, the pulsation and breathing continuing, with rigid muscles, and an erect and inflexible position of body. In most cases there is also a complete suspension of mental power. The duration of the fit varies from two or three hours to as many days, at the end of which the patient rouses as from sleep.

Special Causes.—A morbid state of the liver; powerful menta excitement; long-continued meditation on a particular subject; prolonged suspense of mind; venereal excesses; self-pollution or onanism.

Treatment.—Out-door exercise by walking, riding, sailing; varied scenery; lively company; cheerful conversation; amusements of the laughable kind; regular employment or occupation, with a daily bath and plain food.

Catalepsy.—The only essential distinction authors make between

ecstasy and trance is that of the flexibility or inflexibility of the muscles; in the disease under consideration the muscles are lax and yielding, and the body yields to and retains any given position. The eyes remain open, and are fixed intently upon some object, but usually no perception accompanies the apparent vision. The fit generally comes on without premonition, and in most cases closes with singing. Its duration is from a few minutes to several days. This affection is sometimes counterfeited, and the real disease has been sometimes mistaken for actual death. The causes and treatment are the same as those of the preceding disease.

LETHARGY.—*Deep sleep* does not perfectly express the leading character of this disease, as it is sometimes wanting. Lethargy is distinguished from asphyxia, ecstasy, and catalepsy, by the apparent general ease and quietude of the body; and from apoplexy, by the eyelids being closed and the limbs gently reclining, as in natural sleep.

Symptoms.—Sometimes the sleep is profound, and without intervals of sensation, waking, or consciousness; sometimes the sleep is remissive, and the patient occasionally awakens and recovers sensation and speech, constituting the *coma somnolentum* of authors; and in a third variety—the *typhomania* and *coma vigil* of pathologists—there is a perfect lethargy or insensibility of the body; while the mind is only imperfectly lethargic, manifesting confused and wandering ideas, and, during sleep, possessing a belief of wakefulness. This form is frequently a symptom in various fevers.

Special Causes.—Violent mental commotion, fright, furious anger, excessive mental labor, night-work, repelled eruptions or exanthems, congestion or effusion in the brain.

Treatment.—Essentially the same as in the preceding two diseases, save that the exercise must be of the recreative rather than laborious kind. The pouring head-bath is a promising measure during the paroxysm.

APOPLEXY.—This disease is one of the results of a constipated, obstructed, plethoric, and overburdened body. Excessive alimentation, with defective depuration, and some internal visceral obstructions or compressions, are the obvious conditions on which the apoplectic fit depends; and hence we rarely witness the disease except among the full-fed, the corpulent or obese, and the gross or high livers; and even then we almost invariably find inattention to the functions of the excreting organs or outlets of the body among the predisposing circumstances.

This view is simple enough, and not difficult to understand. But in medical books we find a world of confusion on the whole subject. Every thing relating to its causes, seat, nature, and proper treatment, is there hypothetical, unsettled, contradictory—a mountain mass of scientific absurdity and erudite inconsistency.

Some authors regard it as a disease of the sanguineous system; others as an affection of the nervous system. Some writers contend that the immediate cause is *always* some effusion, extravasation, or other structural derangement in the brain; while others declare that such circumstances are *never* necessary conditions. Some pathologists argue that *compression* of the brain is the universal immediate cause; while others as ably theorise that the brain is *incompressible*. And in relation to treatment, some authors rely on copious bleedings and other depletory processes as the only hopeful treatment; others condemn large bleedings as injurious, but go for small ones; while others condemn all bleeding and all depletion as bad, and advocate the very opposite treatment—brandy and general stimulants; and yet others consider bleeding good in some cases and bad in others, the great point of skill in the physician being to determine when to employ and when to withhold the lancet.

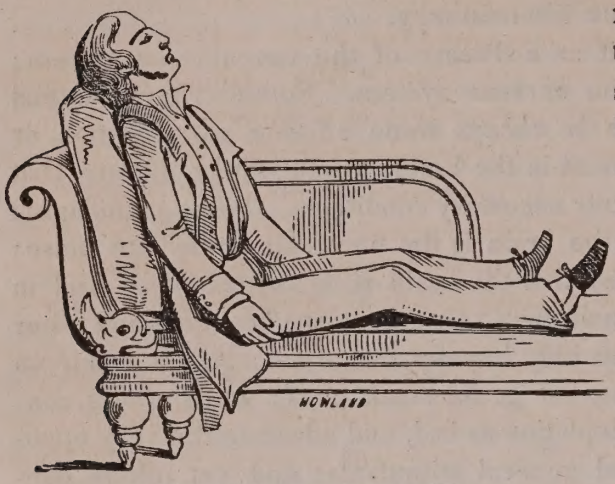
Symptoms.—The distinctions which authors make of this disease, into *sanguineous* and *serous*, *entonic* and *atonic*, *simple* and *congestive*, etc., are unimportant, as they relate only to the greater or less debility of the patient at the time of attack. Sometimes the disease comes on suddenly without the least premonition; sometimes the attack is preceded by a sudden paralysis of one side of the body, and sometimes it is ushered in by acute headache, nausea, faintness, noises in the ears, confused vision, incoherence of ideas, loss of memory, and numbness of the extremities. The fit is characterized by complete insensibility; slow, noisy, and usually stertorous or puffing breathing; impeded deglutition; flushed and livid countenance; prominent and motionless eye, and generally a fixed or contracted state of the pupil; the limbs are rigid, motionless, or convulsed; the bowels are obstinately constipated, or the fæces pass involuntarily; the urine is passed unconsciously, or retained until the bladder is full, then dribbling away. The pulse is variable; it may be full, hard, and quick, or weak and frequent.

Diagnosis.—It may be distinguished from the *stupor of drunkenness*, by the alcoholic odor of the breath in intoxication, and from the *narcosis* produced by various poisons, by the capability of occasionally rousing the patient in the latter affection.

Treatment.—The first thing to be done is to remove the patient to a

cool, spacious, well-ventilated apartment, loosen all the clothing about the chest, remove every thing from around the neck, and place him in an easy and nearly upright posture, as in fig. 188.

Fig. 138.



POSITION IN APOPLEXY.

Follow the preparatory measures with the curative processes, which consist mainly of the pouring head bath; warm water and warm cloths to the feet, and occasionally hot fomentations to the abdomen. If the fit continue, the cold stream may be applied to the head for a quarter to half an hour, several times a day; the cold wet girdle to the abdomen should succeed the hot fomentation, which may be resorted to every two or three hours, for ten or fifteen minutes each time; and friction to the lower extremities with a cold wet cloth, followed by the warm flannel or dry hand rubbing, is a valuable auxiliary. No attempt should be made to give any thing by the mouth, until the breathing is materially relieved, and then only moderate draughts of cold water should be administered.

The *prophylaxis*, or preventive medication, consists in a daily cold bath, plain, simple, abstemious diet, regular hours for eating, laboring, and resting, and a careful avoidance of all violent exertion, strong mental excitements, depressing passions, etc.

PALSY—PARALYSIS—PARESIS.—The same general causes which tend to the production of apoplexy, are among the most efficient predisponents to palsy. The disease before us, however, is more frequently dependent on organic changes; and when merely functional, is more generally connected with nervous exhaustion. The ancients regarded apoplexy and palsy as modifications of one essential disease; "apoplexy being a universal palsy, and palsy a partial apoplexy."

Symptoms.—Paralysis may be attended with a total or partial loss of sensation only in the part affected, or a loss of voluntary motion only, or of both. The precursive symptoms are sometimes the same as those of apoplexy, but more generally the disease comes on gradually, an occasional sense of weakness, and troublesome but transient feelings of numbness being the leading admonitions; and these are often ob-

servable in a single finger, in one eye, the tongue, or one side of the face alone.

In the *hemiplegic* variety the disease is confined to one side of the body, which is affected from the top to the bottom of the mesial line. This form is often a sequel of apoplexy.

In the *paraplegic* variety the lower part of the body is paralyzed on both sides, or any part below the head. When not caused by some local injury, it is almost always preceded by costiveness.

Particular or *local* palsy is confined to particular limbs, or to a particular part of the body. When it affects the face, the expression of countenance is peculiar, the features are drawn to one side, and of course the two sides are not symmetrical, and the deformity is increased when the patient attempts to whistle, speak, laugh, cry, sneeze, or cough.

A variety of local paralysis, to which those who work in quicksilver mines, at water-gilding, etc., are subject, called *mercurial tremor*, comes on with weakness and convulsive twitchings in the arms, gradually extending to the lower extremities, and finally to the whole body; and another variety, called *lead palsy*, or *dropped hand*, which attacks glaziers, plumbers, oil-painters, enamel card-makers, etc., begins by a feeling of weakness in the fingers, and extends to the wrist, but rarely beyond it, shooting pains affect the arm and shoulder; the parts affected waste and emaciate, and the hand hangs loosely and uselessly at the wrist.

Special Causes.—Most of the causes of apoplexy: enlarged or indurated liver or spleen; constipation; venereal excesses; metallic fumes; narcotics; alcohol; pungent stimulants; acrid medicines, as copavia, turpentine; sudden and extreme alternations of temperature; pressure upon the brain, spinal marrow, etc.; fever tumors, injuries, extravasations, effusions; loss of nervous communication from structural degeneration; intense mental emotion; prolonged wakefulness, or excessive night-work.

Treatment.—The prospect of cure must be predicated upon the prospect of the cause or causes being structural or functional, which point, however, is not always easy to determine. But in either case the plan of medication is obvious, and the same. Some few cases are attended with a difficulty of respiration, and the indications of compression of the brain, resembling apoplexy, and require similar management. For bathing purposes, water should be employed as cold as can be borne without permanent discomfort; though, as a general rule, the baths should be of short duration. In paralysis of one side, the ablution or dripping-sheet may be the most convenient general bath; the cat-

sheet pack, followed by the plunge, is still better when there is a good degree of remaining vitality. When the lower part of the body or lower extremities are palsied, the shallow-bath is evidently the best leading water process, and it may be aided by frequent hip and foot-baths. In all cases thorough friction by means of flannels, flesh-brushes, hand-rubbing, shampooing, etc., should follow the application of water. A moderate douche applied generally to the spine, and locally to the part affected is serviceable in most cases. When the superficial heat is too low, or the general torpor too great to admit of the full-sheet pack, the half-sheet may be beneficially employed. Whenever the extremities, or any portions of either of them are paralyzed, the wet compresses, well covered, should be constantly worn and frequently renewed. Careful attention must be paid to the diet; and to the state of the bowels. Cool injections are generally necessary daily; the patient should drink moderately of cold water, and the general regimen should be precisely on the plan adapted to, and recommended for, the cure of dyspepsia.

CHAPTER XII.

VISCERAL TURGESCENCE.

A SWELLING, fullness, or turgescence may exist in any part or organ in temporary obstructions, congestions, or inflammations; but the present chapter is limited to those affections of the internal viscera in which the enlargement is chronic or permanent. It includes the following varieties, which make the species of Dr. Good's genus *parabysma:*

Hepatic—	Enlargement of the	Liver;
Splenic,	"	" Spleen;
Pancreatic,	"	" Pancreas;
Mesenteric,	"	" Mesentery;
Intestinal,	"	" Intestines;
Omental,	"	" Omentum;
Complicated,	"	" Various Organs.

ENLARGEMENT OF THE LIVER.—The structure and functions of the liver, as described in the physiological part of this work, explain the reasons why the liver is more subject to chronic enlargement than any

other organ in the body. The morbid alterations of structure which constitute its intumescence are various, as simple swelling, tubercular formations; hydatid growths; hardening, or induration; softening, or fatty degeneration; and that result of bad living and putrescent blood which pathologists have called *black ramollissement*, in which the organ is reduced to a dark-colored mass of very little consistence, etc.—conditions which are difficult of diagnosis during life. Another form of structural derangement has been called *gin-liver*, in which the biliary portion of the liver is both hypertrophied and indurated, as well as dropsical, from the effect of the free use of ardent spirits.

Symptoms.—With general derangement of health, and various symptoms of indigestion, particularly pale, yellow countenance, irregular and often whitish injections, a hard tumor may be found in the right hypochondrium, verging toward and often appearing at the pit of the stomach. In dropsical persons the swelling is sometimes enormous. An enlarged or indurated liver is common to persons who have suffered frequent or prolonged attacks of ague and fever, and has then been denominated *ague cake.*

Special Causes.—All the common causes of vitiated blood and impure secretions tend to disease the liver; but an obstructed skin, by which the decomposing and putrescent particles of the body are retained in the system, is the most efficient among them. Among the causes which operate indirectly in producing obstruction and enlargement of the liver, are concentrated food, animal oils, or greasy matters, swine-flesh, shell-fish, stale meats, old cheese, etc.; and among those which operate more directly to produce functional disturbance, followed by organic changes, are alcohol, tobacco, hot drinks, violent passions, etc.

Treatment.—The indications are, 1. To promote as vigorous absorption throughout the entire lymphatic system as possible. 2. To purify and invigorate the general system. For fulfilling the first indication, the "hunger-cure," moderately but perseveringly employed, and a moderate douche, frequently applied over the back, especially on its upper portion and over the shoulder-blades, are the leading measures; and for the second, the wet-sheet pack, or shallow-bath, or both, where the external temperature is considerable, are the best among various useful processes. The abdominal compress should not be neglected; and when there is pain or tenderness about the epigastric region, or in its vicinity, or when the bowels are habitually constipated, the warm stream douche to the whole abdomen, followed by the cold dash, will be advantageous.

I may just observe, *en passant*, that there is some slight discrepancy in the opinions of standard medical authors regarding the treatment of

the malady under consideration. Thus, Dr. Elliotson recommends iodine and mercury as the principal remedies; but Abercrombie says that the mercurial practice uniformly sinks the patient in a very rapid manner.

ENLARGEMENT OF THE SPLEEN.—Pathologists seem to be generally of the opinion that structural disorders of the spleen occasion but very little mischief to the organic economy. I think differently. It is true that the consequences are much less apparent; but if the opinion I have heretofore advocated respecting the functional office of the spleen is correct, a derangement of its function must be followed by a loss of power, to some extent, throughout the entire range of the organic or nutritive functions; although such result would not be manifested by any special local symptoms, as in the case of a similar morbid condition of the liver.

Baron Dupuytren found that dogs maintained apparent good health after having their spleens extirpated; but medical authors generally confess that "the more the spleen exceeds its natural size in the human subject, and the longer it retains this abnormal condition, the more are the functions of respiration, digestion, etc., disturbed, and the greater is the impairment of the general health." The key to an explanation of all these facts is within reach. The spleen is an appendage to the higher class, or brain-endowed class, of animals; and its especial office is to provide in part for the additional supply of organic nervous influence rendered necessary by the superstructure of the encephalic mass, while it performs a subordinate duty in supplying additional nervous influence to the general nutritive system. Hence the importance of the spleen in the animal kingdom has a direct relation to the size of the brain; which fact accounts for the lesser disturbance its disease or removal should produce in the small-brained than in the large-brained animal.

Symptoms.—It is known by an indurated tumor in the left hypochondrium, verging toward the spine; as with the preceding disease, there are symptoms of general ill health; but while in enlargements of the liver these symptoms assume the forms of jaundice and dyspepsia, they will, in induration of the spleen, appear in the shape usually termed nervous debility. The patient seldom complains of pain in the region of the organ affected; his appetite is good, but he loses flesh and muscular strength; his features have a dark, bilious, or mahogany hue; the skin is dry, the lips are pale, and the patient is not infrequently morose and desponding.

Special Causes.—The disease often appears after obstinate intermit

tent or remittent fevers; scrofulous constitutions, and constitutions debilitated by intemperance are very liable to it; marshy situations and stagnant waters occasion it; it has followed suppressed menstruation; and medical authors name Peruvian bark, which is so immoderately administered in intermittent fevers, as a cause of enlarged spleen. This affection also called *ague cake.*

Treatment.—The douche should be frequently applied, with as much force as the patient can comfortably bear, to the spine and left hypochondriac region; and in all other respects the plan recommended for enlarged liver is to be pursued.

Enlargement of the Pancreas.—This is a rare disease, or at least, rarely detected in the living subject, but occasionally abscesses, scirrhus indurations, tubercles, calculous depositions, etc., have been found to occupy a part or the whole of its structure.

Symptoms.—These are obscure, except in extreme cases, when a hard, elongated tumor may be detected, extending transversely in the epigastric region, and accompanied with symptoms of dyspepsia and general debility.

Special Causes.—From the analogy existing between the functions of the salivary glands and pancreas, authors have judged the habitual excitement of the excretories of the former might be communicated sympathetically to the latter; and that hence tobacco-users were peculiarly liable to the complaint; in confirmation of which, Dr. Darwin relates a fatal case which occurred in a great consumer of the article—"chewing it all the morning, and smoking it all the afternoon."

Treatment.—As in the preceding varieties.

Enlargement of the Mesentery.—Enlargement of this structure may be in the form of hydatids, of tubercles, scirrhus induration; fleshy, adipose, or fungus excrescences, or calculus deposits; or several of these morbid alterations of structure may be coexistent.

Symptoms.—The affection may be known by an indurated and irregular mass of tumors below the stomach, yielding to the pressure of the hand; the countenance is pale and bloated; the appetite is irregular, often voracious; and general atrophy or emaciation attends.

The causes and treatment are similar to those of enlarged liver.

Enlargement of the Intestines.—In some cases the induration is confined to the coats of the intestines; and in others adhesions unite the intestines to the walls of the abdomen and to each other.

Symptoms.—The intumescence may be round or elongated, hard or

circumscribed; but is movable by pressure made with both hands; the action of the bowels is irregular; there is usually obstinate vomiting, and more or less fever and emaciation.

Treatment.—In addition to the general remedial plan applicable to all varieties of visceral turgescence, the peculiar symptoms of the affection before us demand frequent sips of iced water, cold compresses to the stomach, and the free employment of tepid injections.

Enlargement of the Omentum.—Turgescence of the omental portion of the peritoneum, is usually of a complicated character—indurated, scirrhus, cartilaginous, and tuberculated; in some instances the structure acquires almost a stony hardness.

Symptoms.—The tumor is indurated and diffused, extending frequently over the entire abdomen; it is accompanied with general emaciation and difficulty of breathing.

The treatment does not differ essentially from that appertaining to enlarged liver.

Complicated Visceral Enlargement.—This is merely a conjoint existence of several of the diseases we have already considered. It is denoted by a hard, elevated, and distended abdomen, resembling that of pregnancy; the belly is, however, more or less knotty and unequal; the respiration is but slightly disturbed; but there is usually acute pain, thirst, nausea, and vomiting. A diseased liver is the common starting-point of these structural monstrosities; and our only chance of cure is to employ assiduously, in the infancy of its malady, all the remedial appliances recommended under the head of enlargement of that organ.

CHAPTER XIII.

DROPSICAL DISEASES.

The character of a dropsical affection may be defined: a pale, indolent, and inelastic distention of some part or of the whole body, from accumulation of a watery fluid in the areolar tissue or other natural cavities. There is however, one exception to this definition, in the case of *internal hydrocephalus*, which, though usually regarded as a dropsical disease, is, in reality, a strumous inflammation of the brain

The principal forms of disease belonging to the chapter before us may be grouped:

Cellular Dropsy { General—Anasarca, Local—Œdema.
Dropsy of the Head { External Hydrocephalus, Internal Hydrocephalus.
Dropsy of the Spine—Spina Bifida.
Dropsy of the Chest—Hydrothorax.
Dropsy of the Abdomen—Ascites.
Dropsy of the Ovary—Hydrops Ovarii.
Dropsy of the Fallopian Tubes—Hydrops Tubalis.
Dropsy of the Womb—Hydrops Uteri.
Dropsy of the Scrotum—Hydrocele.
Wind Dropsy—Emphysema { Cellular, Abdominal, Uterine.
Inflammatory Dropsy { Puerperal Tumid Leg, Tropical Tumid Leg.

It is amusing to read the lengthened discussions which have been carried on by medical theorists respecting the proximate cause or essential nature of dropsy; one party regarding it as a disease depending on diminished absorption, and the other as ably contending that the fault consists in increased exhalation. The practice predicated on the former theory is stimulation, and on the latter, antiphlogistication. But as neither quinine nor bleeding effected a cure, a third party has lately entered the field of controversy, and cut the Gordian knot, by blending both doctrines in one; and declaring that diminished absorption *and* increased exhalation produce the disease, the therapeutic indication being to balance the action between the absorbents and exhalents. To this party we are indebted for the mercurial treatment of dropsy, which has proved even *worse* than its *bad* predecessors.

Cellular Dropsy.—This affection is called *anasarca* when it extends over the whole body, and *œdema* when limited to the areolar texture of the limbs.

Symptoms.—Cold and diffusive swelling or puffiness of the skin, which pits beneath the pressure of the fingers; the intumescence is greatest in depending situations; and around the feet and ankles the accumulation increases toward evening, and decreases during the night. The skin is paler than natural, and when the distention is great it assumes a shining appearance, which often becomes livid and discolored, and not unfrequently bursts in extreme cases.

Special Causes.—All the causes of general debility predispose to dropsy. Intemperance, repeated eruptions, exhausting discharges, suppressed evacuations, and structural or functional obstructions of the kidneys, skin, and liver, are among the frequent causes. Œdematous swellings of the limbs are often symptomatic in mismenstruation, pregnancy, etc., and frequently a result of mere debility, as in protracted fevers, etc.; constitutions broken down by mercury, are very liable to this disease.

Treatment.—In all dropsical affections of the cellular membrane, the indications are, 1. To promote the absorption of the effused fluid. 2. To prevent its re-accumulation. The first indication is accomplished by promoting the activity of the excretory organs generally; and the second by strengthening the whole system; and either indication must be made the leading one, as obstruction or debility is the leading proximate condition. As a general rule, quite cold water is preferable for bathing purposes, but the duration of baths should be short, and succeeded by active and prolonged, yet gentle friction with silk or soft flannel, or better still, the bare hand. The moderate douche, followed by a thorough rubbing in the dry blanket, and the wet-sheet pack, with warm bottles to the feet, and, if need be, the armpits, are among the best general baths. But as no two cases present the same set of circumstances, the practitioner will always find a wide field for the exercise of judgment. The diet must be mostly of the dry and unconcentrated kind, and water should be drank only to the extent demanded by actual thirst. Tepid injections should be freely employed when there is the least tendency to constipation. The warm douche, or spray-bath, followed by the cold dash or pail douche, is an excellent process when the swelling is tender and painful, and particularly serviceable if applied to the lower part of the abdomen when the kidneys are torpid or obstructed, which will be known by scanty or difficult urination.

A great deal of importance is attached, by most medical writers on dropsy, to the chemical ingredients in the urine, and the changes this secretion undergoes in hydropic patients; and Dr. Johnson even advises patients at a distance, when writing for advice, to send along a bottle of urine for the purpose of chemical analysis. Now people ought to know that, however amusing or interesting such experiments may be, they are of no utility whatever, as regards the cure of the disease; for whether the urine is a little more or a little less *albuminous*, or *ammoniacal*, or *alkaline*, or *acid*, or *saline*, it is all the same as far as the treatment is concerned.

Dropsy of the Head—Hydrops Capitis.—External dropsy of

the head, commonly called *chronic hydrocephalus*, consists of an accumulation of watery fluid in the ventricles or convolutions of the brain, or between the membranes, or between the bones and dura mater; and internal dropsy—*acute hydrocephalus*—is an inflammation of the membranes or substance of the lower part of the brain, which, in its progress, runs into suppuration, and produces effusion into the ventricles.

Symptoms.—In the first variety there is an œdematous intumescence of the head, while the sutures of the skull are usually separated; the whole head appears preternaturally large, and the fontanelles are prominent; in its advanced stages it is attended with languor, drowsiness, costiveness, vomiting, coma, frequently convulsions, and sometimes strabismus. The second variety—the *cephalitis profunda* of Good's nosology—comes on gradually and insidiously; the precursive disturbances are languor, inactivity, loss of appetite, feverishness, etc.; these are followed by darting pains in the head, great sensibility to light, contracted pupils, extreme restlessness, frequent sighing, disturbed sleep, from which the patient often starts with a scream; in a later stage the bowels are irregular, the pulse small and frequent, and delirium and convulsions sometimes occur; as the disease progresses the pupil dilates, the eyes usually present a squinting appearance, and a low moaning takes the place of the shrieks; and near the fatal termination, double vision or loss of sight, with lethargic stupor, or violent convulsions occurs. Hydrocephalus is peculiar to infancy, and sometimes commences in the fœtus.

Special Causes.—Scrofulous, scorbutic, or syphilitic taint; repelled eruptions; injury to the brain during labor; bad dietetic habits of the mother during pregnancy; frequent exposure of the mother during pregnancy, or of the child soon after birth, to the powers of narcotic poisons, particularly tobacco.

Treatment.—We can promise but little in either form of hydrocephalus unless detected and treated in the early stages. The general plan of management is the same as for the preceding disease, save that a good part of the treatment should be derivative—half, hip, and foot-baths, and the wet girdle to the abdomen. The pouring head-bath is advisable in the chronic or internal variety. The external form has in some instances been relieved by evacuating the water with a lancet, couching-needle, or trochar.

Dropsy of the Spine.—This affection is mostly congenital; it consists of a soft fluctuating tumor on the spine, from fluid accumulated within the coats of the spinal cord, protruding externally in consequence of some portion of the vertebral column being defective. It

is generally fatal, although a cure has taken place spontaneously in a few instances, and several cases have been reported as cured by repeatedly puncturing the sac with a fine needle. With the exception of this surgery, if deemed advisable, the proper course is to attend to the general health, and "trust to nature."

Dropsy of the Chest—Hydrops Thoracis.—In this affection the fluid may accumulate in the cavity or cavities of the pleura on one or both sides, or in the mediastinum, or pericardium, or even the cellular texture of the lungs. These distinctions, however, are neither possible to ascertain during life, nor important practically.

Symptoms.—With a constant sense of oppression in the chest, there is difficult breathing on exercising or reclining; the countenance is more or less livid; the urine scanty and high colored; the pulse is irregular; the extremities are œdematous; the patient is often troubled with startings and palpitations during sleep; a distressing feeling of suffocation frequently attends; and the patient can get no rest but in the erect posture. It usually attacks persons in advanced life.

Special Causes.—Hypertrophy of the heart, aneurism, scirrhus of the stomach and liver, and other organic derangements, frequently produce hydrothorax. When idiopathic, *if ever*, it is produced by the common causes of dropsy.

Treatment.—In a majority of cases our prognosis must be unfavorable; the derivative baths, and the principles already adverted to as applicable to the treatment of dropsy in general, are all our grounds of hope in the case before us. Some few cases are reported in medical works as having been caused by *paracentesis thoracis*—an operation which will be described in the surgical department of this work.

Dropsy of the Abdomen.—*Ascites*, or dropsy of the belly, is called *encysted*, when the fluid is contained in a cyst or sac of adventitious formation, instead of accumulating in the cavity of the abdomen itself.

Symptoms.—It is known by an equal, tense, and heavy intumescence of the whole belly, which distinctly fluctuates to the hand, upon a slight stroke being given to the opposite side.

Diagnosis.—In the *encysted* form the size of the abdomen enlarges gradually and steadily, without experiencing any sudden increase, decrease, or change in the swelling; whereas the distention is often temporarily diminished by treatment or accidental causes, when the accumulation is within the cavity of the abdomen; from *ovarian dropsy*, by the intumescence commencing lower down and on one side in the

latter disease; from *tympanites*, by the dullness on percussion, and by the fluctuation; from *retention of urine*, by the dribbling of water in the latter affection; from *pregnancy*, by the fluctuation, and state of the menses and breasts; and from *cysts* or *hydatids* of the liver, by the swelling in the latter case being more circumscribed, and commencing on one side of the upper part of the abdomen.

Special Causes.—Repelled eruptions, or exanthems, very frequently produce this disease. Mercurial ointments, lead washes, and other discutient and repellent lotions and medicaments, have often changed the morbid action from an external skin disease to an internal dropsy. Suppressed catamenia and metastatic gout are also frequent causes; and it is often symptomatic of diseased or disorganized liver, kidneys, and other organs.

Treatment.—The encysted variety cannot be cured without the operation of tapping the abdomen. The general health should always be improved as much as possible before the operation is performed, for which purpose the packing, douche, and foot-baths are necessary. Surgeons are always apprehensive of danger from inflammation attacking the punctured part, but the danger chiefly arises from the inflammatory or feverish state of the body, or the obstructed condition of the excretories at the time of the operation. If the general system is put in good condition, the simple operation of drawing off the water by tapping can seldom be serious, much less dangerous.

When the watery fluid is collected within the peritoneum an operation is sometimes necessary; but frequently it can be cured by the general plan of management applicable to cellular dropsy. The abdominal bandage, well covered and renewed five or six times a day, and a free use of injections, are specially desirable in this form of dropsy.

Ovarian Dropsy.—Dropsy of the ovary is always of the encysted character, and the cysts are generally combined with enlargement of the ovary itself, which becomes converted into a hard, whitish, cartilaginous mass.

Symptoms.—The tumor commences on one or both sides of the iliac region, and gradually spreads over the abdomen; its surface is unequal, and its fluctuation is obscure and feeble, and in some cases entirely imperceptible. The general health is at first but little impaired.

The causes of ovarian dropsy are similar to those of ascites, and the remedial processes must be conducted on the same general plan. Tapping should never be resorted to until the increasing distention begins seriously to affect the general health; the operation cannot be relied on to effect a permanent cure, but with attention to the general health,

may keep it in check so that the patient may enjoy comfortable health for an indefinite period. In many cases the operation requires to be repeated several times. Extirpation of the ovary has been successful in a few cases; but the majority have not long survived it.

Fallopian Dropsy.—Dropsy of the Fallopian tube is extremely rare; in its early stage it is known by a heavy, elongated swelling of the iliac region, spreading transversely, with obscure fluctuation. The quantity of fluid is generally greater than that accumulated in the preceding variety; and the prospect of cure is still less promising, although the same measures are applicable.

Dropsy of the Womb.—This disease—the *hydrometra* of the old authors—is generally the result of some structural affection of the uterus. In some few cases, when the orifice of the uterus is closed, water collects in its cavity; sometimes a large cyst, or cluster of hydatids, originating between its tunics, is discharged, accompanied with severe flooding; and occasionally the fluid accumulates in its cellular tissue, by which the organ is distended to an enormous size, while the whole abdomen appears anasarcous.

Symptoms.—Heavy, circumscribed tumor or protuberance in the hypogastric region, attended with obscure fluctuation, and progressively enlarging; the mouth of the uterus is thin and yielding, and the complaint is unaccompanied with pregnancy or ischury.

Treatment.—The general remedial plan is the same as the preceding varieties. When the mouth of the uterus is closed, the water may be evacuated by the introduction of a canula.

Dropsy of the Scrotum.—In some cases the fluid is contained in the tunica vaginalis, or surrounding sheath of the testis; sometimes in the cellular membrane of the scrotum; and in a third variety the fluid has accumulated in the tunica vaginalis of the spermatic cord. *Congenital hydrocele* is that form of the disease in which the communication between the cavities of the peritoneum and tunica vaginalis is inclosed, the fluid collecting within the latter.

Symptoms.—The *vaginal*, or first named variety, is the proper hydrocele. The intumescence is soft, transparent, and pyriform; it is unattended with pain, and enlarges gradually. In some cases the tunic is so distended and transparent that a candle may be seen through its contents.

Treatment.—In recent cases, very cold sitz-baths and the ascending douche, each repeated several times a day, or refrigerating local appli-

cations of iced-water or pounded ice, in connection with the general treatment recommended for the preceding cases, will often effect a cure. When the case has been of long standing, the operation, to be described hereafter, will be necessary.

Emphysema—Inflation—Wind-Dropsy.—This affection, which is caused by an accumulation of air in the natural cavities, differs from dropsy proper in the distention being elastic and sonorous. Sometimes the disease results from external injuries penetrating the lungs; sometimes the air is formed by a process of putrefaction or decomposition; and sometimes it is secreted directly from the blood.

Symptoms.—In the *cellular* variety—the *pneumatosis* of Sauvages—the distention is sometimes limited to particular parts of the body, and sometimes extends over the whole surface. It is marked by a tense, glabrous, diffusive intumescence of the skin, which crackles beneath the pressure of the fingers. When arising from a wound in the chest, which penetrates the lungs—*traumatic emphysema*—the inspired air may rush into the cavity of the chest, the cellular membrane of the lungs, and even become diffused throughout the areolar tissue, producing a universal inflation, which is attended with violent palpitation and extreme danger of suffocation. Occasionally the inflation is confined to one side of the chest; it is then called *pneumo-thorax;* and this form is sometimes produced by ulcerations which destroy some part of the pulmonary structure. When arising from fish-poison, mushrooms, or other venom, the disease is accompanied with extensive signs of putrescence and impending mortification.

In the *abdominal* variety—*tympany*—there is a tense, light, and equable distention of the belly, which distinctly resounds to a stroke of the hand.

When the *uterus* is inflated with air, there is light, tense, circumscribed intumescence in the lower part of the abdomen, obscurely sonorous, and accompanied with occasional discharges of wind through the mouth of the womb.

Treatment.—All the varieties of the disease before us are, happily, very rare, with the exception perhaps of tympany, and this is mostly a symptomatic affection. The general plan of treatment is the same as for dropsy of the same structure or organs. In emphysema from wounded lungs, the operation of puncturing between the ribs is sometimes attended with benefit, and the dripping-sheet, followed by dry rubbing or hand friction, is probably the best of the strictly hydrotherapeutic processes. When occasioned by poison, the wet-sheet, so managed as to produce moderate diaphoresis; sips of iced-water, copious

injections, etc., on the plan recommended for *anatomical erythema*, should be resorted to. In the abdominal and uterine varieties, copious cold injections by means of the pump and vaginal syringes, are to be frequently employed; the spray-bath and the ascending douche are also valuable assistants.

Inflammatory Dropsy.—This term is rather awkward, but, unfortunately, I cannot find in the whole range of pathological nomenclature any more appropriate one; and I do not care to invent new technicalities, especially as we have already a vast superabundance. The term comprehends the two diseases, *elephant leg*, which is peculiar to hot climates, and *phlegmasia dolens*, which is peculiar to lying-in women, both of which are characterized by a tense, diffuse, inflammatory swelling of one leg.

Symptoms.—In the tumid leg of childbirth, which has been variously denominated *puerperal swelled leg*, *bucnemia sparganosis*, *phlegmasia dolens*, *phlegmasia lactea*, *ecchymoma lymphatica*, *anasarca serosa*, *crural phlebitis*, and *cruvitis*, the attack usually comes on in the second or third week after parturition; the intumescence is pale, glabrous, equable, elastic, and acutely tender; to the touch there is a sensation of numerous irregular prominences under the skin, and it is accompanied with a constitutional febrile disturbance of the hectic type. In a majority of cases the attack commences with pain in the groin of one side, accompanied with fever, and followed by a swelling, which extends down the thigh and leg to the foot, and in a day or two the whole limb is double its natural size, hot, smooth, exquisitely tender, and moved with great difficulty. The fever usually begins to decline in two or three weeks, but in some cases runs for six or eight weeks, causing extreme emaciation. In a very few instances both limbs are affected simultaneously; and in still rarer instances the arms have been attacked; in many cases the affected limb has remained enlarged and weak through life. It may be added here that a disease very like the one before us, if not identical, has sometimes affected the male sex.

The second variety, the *Barbadoes leg*, *bucnemia tropica*, *elephant leg*, is common to hot climates, especially the West Indies, Arabia, and the Polynesian Isles, where it is called *yava-skin*, from the supposition that it is caused by drinking a heating beverage called *yava;* "and like the gout among ourselves," says Dr. Good, "is regarded in a sort of *honorable* light." It is known, however, in temperate climates, and a few cases have occurred in the United States. The limb is hard, livid, and enormously misshapen; the skin is at first glabrous, but afterward becomes thick, scaly, and warty; in some places bulging out, and in

others deeply indented; the attending fever is irregularly erratic and intermittent, which eventually subsides, and the disfigured limb becomes insensible, and only troublesome from its weight and bulk, which, however, is regarded in some semi-civilized countries as a badge of honor, as the gout is in places where the inhabitants pretend to be wholly civilized.

Special Causes.—The puerperal variety is unquestionably owing to a condition of body which may significantly be termed the *constipated diathesis.* The general pressure on the blood-vessels and lymphatics during pregnancy, and the inflammatory condition of the whole system, which are the common consequences of the ordinary method in which females are fed and doctored through pregnancy and delivery, are exactly calculated to produce this and many other diseases of the lying-in period. The complaint under consideration, though very common in allopathic practice, has never been known, and probably never will be, where the patient has, through the term of gestation, lived and bathed hydropathically.

The second variety is as clearly among the penalties which merciless and unrelenting nature has attached to the use of debilitating stimulants, and impure, unhealthful, and obstructing food, with inattention to the subject of a clean skin.

Treatment.—Puerperal swelled leg must be treated precisely as an acute inflammation. The wet-sheet pack, or frequent tepid ablutions of the whole body, and the constant employment of cold wet compresses to the local affection, are the leading measures of treatment; cold water may be freely drank; and cool injections are generally necessary. The food must be of the kind called "fever diet" in this work.

Medical authors—and they have elaborated many ponderous treatises on the subject—are singularly at variance, and as it appears to me, singularly *foolish*, in their notions of the nature and treatment of this disease; while their practice, or the disease under their practice, or the patient under both, has been singularly unfortunate.

The second variety can only be successfully medicated in its early stage. The pack and dripping-sheet, the leg-bath and leg-douche are the most important processes, with due attention to simplicity and purity of food. Amputation has been tried, but in most cases tetanus, or a gangrenous ulcer has followed; perhaps, however, because the general health was not duly cared for previously to performing the operation.

CHAPTER XIV.

DISEASES OF MIS-OSSIFICATION.

THE title of the present group of diseases is taken from the most prominent symptom, which, though indicative of an excess, deficiency, or mal-assimilation of the bony structure, does not very well express the essential nature or proximate cause. It includes:

Rickets—Rachia—Rachitis.
Cretinism—Cyrtosis—Cretinismus.
Mollities Ossium—Softening of the Bones.
Fragilitas Ossium—Brittleness of the Bones.
Osthexy—Ossification of soft Structures.
Exostosis—Bony Tumor.

RICKETS.—This disease is probably of modern date. The first account we have of it was published by Glisson, as it occurred in England in the middle of the seventeenth century.

Symptoms.—The malady sometimes exists at birth, but more frequently the first indications are observed from about the eighth month to the third year. It is preceded by a paleness and puffiness of the countenance, and a yellow, sulphur hue of the cheeks; the body at length emaciates, the flesh becomes flaccid, the lower limbs grow thin, while the head increases in bulk, the forehead becomes prominent, the spine bends, the belly is tumid, and the joints are loose and spongy The mental faculties are usually clear and often precocious.

Special Causes.—Hooper says the causes of this disease are, "bad nursing, bad air, bad food, want of cleanliness." It is certainly the most philosophical discourse on œtiology I have ever read in an allopathic book. He might have gone farther back, and told us as truthfully that bad air and bad food, and inattention to personal cleanliness on the part of one or both parents, produce the predisposition to it—the *rachitic diathesis.*

Treatment.—One or two daily ablutions, pure air, plenty of sunshine, *good* mother's milk, abundant cold water-drinking, and brown bread, hominy, wheaten grits, potatoes, and good fruits, are all that need be named among the remedial agencies. More or less deformity will always exist.

Cretinism.—The essential differences between this disease and the preceding, are the tendency to goitre or enlargement of the thyroid gland, and the small size of the brain, with thick skull bones, which characterize the present affection.

Symptoms.—The bony derangement chiefly affects the head and neck; the body is stinted; the skin is wrinkled; the complexion is wan; the countenance is vacant and stupid; the cranium bulges out, particularly in the occipital region, while the crown and temples are depressed; the sensibility is blunted; all the mental faculties are feeble or idiotic; the moral affections seem to be wholly wanting; and a majority of the miserable sufferers are both deaf and dumb.

Special Causes.—Cretinism was first noticed about the same time that rickets first appeared; it has prevailed severely in the low lands of Switzerland, in the secluded valleys of the Alps, and other damp, shaded, or confined places; hence the causes of rickets and cretinism cannot be essentially different, nor need we add any thing to the treatment named for the former.

Mollities Ossium.—A general *flexibility* of the bony structure, formerly denominated *spina ventosa*, is commonly found in the early periods of life, as *fragility* or *brittleness* is peculiar to later age. Its immediate cause is, of course, deficient assimilation of osseous materials, but its more remote and more important cause must lie farther back, in some derangement of the primary nutritive functions.

Symptoms.—A bending or crooking of the bones in different parts of the body, on slight exertion, with little or no pain.

Treatment.—Medical books, in consideration of the deficiency of earthy matter in the bones, have undertaken to remedy the difficulty by introducing phosphate of lime, alkaline carbonates, etc., in liberal doses, into the stomach; and, although such practice may seem very reasonable to those who cannot look beyond a chemical fact to a physiological law, it has never, to my knowledge, been productive of the least benefit. The rational curative measures are the same as for rickets.

Fragilitas Ossium.—In this affection the substance of the bones becomes so brittle that it is apt to break on slight exertions. The immediate cause is a deficiency of the materials of the gelatinous structure; and the general treatment is the same as for the preceding variety.

Osthexy.—This term imports an *ossific diathesis*, a bony habit of

body. The disease consists in a superfluous secretion and deposit of ossific matter, by which the soft parts are more or less indurated or obstructed.

Authors divide this affection into the *parenchymatous* and *vascular* varieties, as the bony material accumulates in the substance of organs or in the coats or membranes of vessels. The kidneys and bladder are most liable to calculus concretions, for the reason that they are especially designed to secrete from the blood and expel from the body the greater portion of effete alkaline and saline matters; hence *gravel* and *stone* may result from too great a portion of earthy material in the food, or from deficient elimination of its excess in consequence of functional obstruction or debility. Ossific deposites are also occasionally found in the brain, lungs, thymus gland, substance of the heart, structures of the eye, muscles, etc. The vascular form most frequently affects the aorta or other large arteries, and the mitral valves; but in some instances the pleura and other membranes, the trachea, and various cartilaginous structures ossify. In all these cases the symptoms are exceedingly obscure, and the treatment cannot be better expressed than by the general phrase—attention to the general health.

Exostosis.—Calculous or bony tumors may be seated immovably on a bone, or on the periosteum, or pendulously in a joint, or fixed or movable in some fleshy part of the body. These affections are generally sequelæ of gout, rheumatism, syphilis, etc., but sometimes appear in persons of ordinary, though, of course, not perfect health. They are all cases for surgical treatment, and are only to be cured by extirpation or amputation.

CHAPTER XV.

DISEASES OF SENSATION

The diseases of the present group are somewhat incongruous in a nosological point of view; but as they are susceptible of a generic definition, no direct violation of pathological propriety is committed in the arrangement. They may be distinguished by darting or local pains, occurring in paroxysms with irregular intervals, or by perverted sensation, without fever, inflammation, or structural change.

They are all symptomatic of nervous exhaustion, functional obstruc-

tion, malformation, or local accident or injury; and it is only when the primary morbid condition is too obscure to be recognized, that they are to be treated as idiopathic maladies. The following are all that require special consideration:

Cephalalgia,	Syncope,
Neuralgia,	Morbid Sight,
Sleeplessness,	Morbid Hearing,
Restlessness,	Morbid Smell,
Antipathy,	Morbid Taste,
Vertigo,	Morbid Touch.

CEPHALALGIA—CEPHALÆA—HEADACHE.—The unbiassed and intelligent student, who will diligently labor through the various attempts which have been made by medical authors to define, describe, arrange, classify, expound, and medicate the single and seemingly simple subject of headache, will find enough of confusion confounded to convince him that a system, as baseless as the fabric of a vision, has engaged the minds of many medical philosophers, rather than a careful and correct observation and arrangement of the phenomena of truth, nature, and common sense. The ordinary and every day causes of headache are, indigestible food, overloaded stomach, constipated bowels, torpid liver, inactive kidneys, obstructed skin, oppressed lungs, acidity, flatulence, violent passions, suppressed natural evacuations of all kinds, and their consequences, thick blood, irregular circulation, etc., etc., to which may be added the direct effect of stimulating drinks or nervines, or their sudden withdrawal after the system has been accustomed to their use. And the pain of headache will be *acute*, *chronic*, *periodic*, *throbbing*, *local*, or *general*, etc., according to a multitude of circumstances which bear upon each individual case. All this is plain and straightforward. But let us see what the books say. Much learning has surely made them mad. Thus Sauvages divides headache into *acute*, *chronic*, and *partial*; the acute he subdivides into *plethoric*, *catamenial*, *hæmorrhoidal*, *dyspeptic*, *febrile*, *throbbing*, *intermittent*, *puerperal*, *inflammatory*, *catarrhal*, *nervous*, *hysterical*, and the *metallic!* the chronic he subdivides into *syphilitic*, *scorbutic*, *arthritic*, *remittent*, *melancholic*, *plicose*, and *serous*; and the partial he subdivides into *pains* in *eyes*, *sockets*, and frontal *sinuses*, *purulent*, *nephralgic*, and the *lunatic hemicrania*. Frank divides headache into four species, *cephalalgia*, *cephalæa*, *hemicrania*, and *clavus*; and in respect to their nature he subdivides these into *inflammatory*, *rheumatic*, *gastric*, *arthritic*, *scorbutic*, *periodic*, *scrofulous*, *carcinomatous*, *syphilitic*, and *nervous*. Dr. Good divides headache into *stupid*, *chronic*, *throbbing*, *megrim*, and *sick*. Dr. Burder

divides headache into *muscular*, *periosteal*, *congestive*, *organic*, *dyspeptic*, and *periodic*. Dr. Weatherhead divides headache into *dyspeptic*, *nervous*, *plethoric*, *rheumatic*, *arthritic*, and *organic*. Dr. Copland divides headache into *nervous*, *congestive*, *plethoric* and *inflammatory*, *dyspeptic* and *bilious*, *cerebral*, *pericranial* or *neuralgic*, *rheumatic* and *arthritic*, *periodic*, *hypochondriacal*, and the *sympathetic*. Dr. Hooper divides headache into *internal* and *external*; the former being subdivided into *congestive*, *sympathetic or dyspeptic*, and *organic*; and the latter into *muscular*, *periosteal*, and *neuralgic* etc., etc.

The same confusion prevails among medica authors with respect to the pathology and treatment of this complaint.

Treatment.—Whether idiopathic or symptomatic, all severe headaches require prompt and special palliative medication, although the cure must be sought in the removal of the morbid condition on which they depend. The majority of cases can be relieved at once by putting the feet in warm water, and applying cold wet cloths to the head. The hot fomentation to the abdomen is often sufficient. When arising from suppressed menstruation the warm hip-bath is advisable. When the cause is a sudden cold, the wet-sheet pack should be employed. If the stomach is exceedingly irritable, and troubled with obstinate nausea and vomiting, warm water-drinking and the pouring head-bath constitute the most efficacious practice. When arising from the sudden abstraction of stimuli, as of wine, tea, coffee, tobacco, etc., the patient should keep very quiet for several days, and walk, sit, or lie down, as he finds most comfortable, and take frequent warm foot and cold head-baths, waiting patiently for nature to restore the natural sensibility and tone of the organism, so that its machinery can work again without the lash of artificial stimulation.

NEURALGIA—NERVE-ACHE.—Neuralgia is another of those diseases which are among the growing evils of the increasingly enervating customs of civilized society. Until a very modern date, the only form of this disease known to medical men was the *tic doloreux*, or neuralgia of the face; now, however, neuralgic pains, in almost all parts of the body, are very common afflictions. The face, jaws, feet and breast, are, however, most frequently the parts affected.

Symptoms.—The disease is recognized by acute lancinating pains along the course of one or more nervous branches of the organ or part affected, which recur in short paroxysms, with irregular intervals; usually there is more or less twitching or irregular convulsive motion of the adjoining muscles. In facial neuralgia the pain shoots from the region of the mouth to the eyes, ears, cheek, palate, fauces, and teeth,

sound teeth have sometimes been extracted on the supposition that some concealed ulcer or caries occasioned the pain. When the foot is attacked, there are racking pains about the heel, darting toward the ankle and bones of the tarsus. In nerve-ache of the breast the sharp darting pains usually divaricate from a fixed point in the breast, and shoot down the course of the ribs and arm to the elbow. When other parts, organs, or particular muscles are attacked, the disease is easily recognized by the sharp, darting, cutting, and intermitting character of the pain.

Special Causes.—All the causes of dyspepsia, and every thing conducive to nervous debility, are among the causes also of neuralgia. Those enervating influences which more especially predispose to this disease are tea, coffee, alcohol, tobacco, excessive brain labor, and depressing emotions, as grief, fear, anxiety, suspense, disappointment, etc.

Treatment.—I know not upon what principle our allopathic friend propose all the most virulent poisons of their materia medica for the treatment of neuralgia, unless it is that the more powerful the pain the more potent should be the poison; or in other words, the more a patient suffers from disease, the more he should be made to suffer from drugs. Arsenic, belladona, Prussic acid, henbane, strychnine, opium, quinine, etc., etc., in terrific doses, are put forward as the most promising remedies, while surgery comes in and kindly offers to interrupt the morbid sensibility by dividing the affected nerves between their point of distribution and the common sensorium.

The disease before us appears under so many complications that the most experienced hydropath will have to feel his way in the majority of cases. Every circumstance affecting the general health must first be inquired into and placed under organic law. Usually some one of the excretories will have been for a long time torpid, and frequently the bowels, skin, kidneys, and liver are all obstructed. The majority of patients we meet with, too, will be worn down with suffering, and poisoned through and through with drugs, or farther reduced by depletions, as bleedings and blisterings; hence they will generally be exceedingly tender and susceptible.

The treatment should generally begin with gentle bathing in tepid or warm water, followed by moderate friction or hand-rubbing. The temperature of the water should be reduced as fast as possible—taking care, however, to avoid aggravating the pain by a sudden chill—consistently with securing a comfortable glow after each application. In some few cases, where the external heat and capillary circulation are not materially deficient, cold, and even very cold water, is more sedative and agreeable than tepid or warm. Local baths, as compresses, half, hip

and foot-baths, should be first employed, followed by the half or full pack, dripping-sheet, plunge, and douche, as the morbid sensibility diminishes and the strength improves. In many cases there is a kind of sub-paralysis of the limbs, or a rheumatic lameness and rigidity of the muscles of the affected part; in these cases the warm douche, followed by the cold dash, is excellent.

Sleeplessness.—This affection, which is characterized by a difficulty or inability of sleeping, is, when not symptomatic, produced by some mental excitement or bodily disquiet. In the former case the mind is listless to surrounding objects; and in the latter the attention is alive to them. Severe study, intense attention to business, and protracted watching, are common causes of the former variety, and cold feet, eating near bed-time, taking stimulating drink in the evening when unaccustomed to it, or abstaining after having been habituated to it, are the ordinary causes of the latter. The remedies are a hip-bath or dripping-sheet at bedtime, when the trouble arises from mental causes; and the warm foot-bath, abdominal girdle, active out-door walking, and exercising in a cold room while in a state of nudity—a form of air-bath—when the causes are corporeal.

Restlessness.—There are two states of general bodily disquietude, which authors have regarded as distinct diseases. One is familiarly called *fidgets*, and distinguished by a perpetual desire to change the bodily position; and the other, called *anxiety*, is known by an equally restless desire of perpetual locomotion. The common cause of the fidgety variety is too long confinement of the whole body, or any part of it, in a nearly motionless position. Children at school, writers at the desk, females with the needle, especially those of active brains and irritable temperament, often suffer severely for want of free and frequent exercise of the whole muscular system. Worms and some kinds of skin diseases sometimes produce this complaint.

The anxious form of restlessness is peculiar to persons of a highly nervous temperament, and is attended with a distressing or uneasy sensation, particularly about the præcordia. Constipation is a frequent cause in acutely irritable persons, and difficult, local, or pecuniary circumstances, or projects in relation to the future, on which the mind dwells intensely, are among the most frequent of the mental causes; and our medication must be directed to the removal of the existing cause, whatever that may chance to be.

Antipathy.—A feeling of intense repugnance or horror at the

presence of particular objects, or the introduction of particular subjects, constitutes one of the many singular infirmities of our fallen nature. Some persons will sicken at the sight or taste of butter or cheese; some find the smell of roses and mint, or the sound of music, painfully disagreeable; some will detect the presence of a cat in the room without the use of the external senses; some are ready to faint at the sight of blood, wounds, sores, crabs, lobsters, toads, vipers, and other unsightly animals; and some will scream frightfully at the appearance of a mouse or spider. *Probably* these peculiar traits of idiosyncrasy may be produced by frights or other accidents in early life, or by some powerful and perhaps forgotten mental impression of the mother during the period of gestation. The only chance of cure seems to be, in gradually accustoming the patient to the object of antipathy.

VERTIGO.—Different forms of vertigo are known by the terms *dizziness*, *swimming of the head*, *blind headache*, and *nervous fainting fit*; it is a frequent accompaniment of headache, and is owing to the same exciting and predisponent causes.

Symptoms.—The patient, while at rest, experiences an illusory gyration, or objects around him seem affected with a whirling motion; there is also a sense or fear of falling, with some degree of mental confusion. In some instances the dizziness is combined with illusory sounds, as whispering, murmuring, ringing of bells, beating of drums, roar of cannon, etc.

Special Causes.—The immediate cause or proximate condition is a preternatural pressure of blood upon the nervous substance of the brain; and this is owing in most cases to a morbid viscidity of the blood from retained bile, perspirable matter, or other effete material.

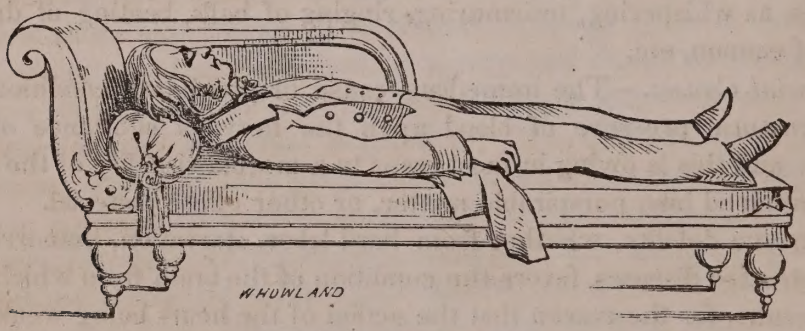
Extreme debility, whether from hard labor, starvation, hemorrhage, or protracted diseases, favors the condition of the brain from which vertigo results, for the reason that the action of the heart being weakened and the capillaries contracted or paralyzed, the blood is pressed with disproportionate force upon the brain. The exciting causes are usually sudden exertion or hurried motion, as raising the head, stooping, etc. Any considerable motion to which the body has never been accustomed, as sailing, swinging, walking circularly, sitting backward in a carriage, etc., may occasion vertiginous sensations in healthy persons. Intoxication, narcosis, and violent fear also produce dizziness, which is experienced on every attempt at motion.

Treatment.—When the body is full and plethoric, or there are evidences of biliary accumulations, a warm water emetic is advisable. In all cases the bowels must be kept entirely free by plain, coarse food

and injections if necessary; and the skin kept open by one or two thorough daily ablutions. In other respects regard must be had to the idiopathic condition. When connected with great debility, emaciation, loss of blood, or inanition, quiet and sleep are among the leading remedial agencies.

SYNCOPE.—*Swooning* and *fainting-fit* are the principal varieties of the malady before us, which is distinguished by diminished sensibility, inability of utterance, with feeble or imperfect motion of the heart and lungs. The general causes are the same as those of the preceding disease, although to the exciting causes may be added extreme pain, violent passions, sympathy, sudden fright, sudden abstraction of blood, rapid evacuation of fluid accumulated in the cavities of the body, as in dropsy, sudden discharge of the matter of extensive abscesses, retrocession of arthritic and eruptive diseases, excessive fatigue, etc. The treatment consists of a free current of cold air; sprinkling cold water in the face; and if the syncope is prolonged, pouring cold water over the head, and applying the cold compress to the stomach; to which may be added the recumbent position, fig. 189, and warm water with friction to the lower extremities. As soon as the patient can swallow a draught of cold water should be administered.

Fig. 189.



POSTURE IN SYNCOPE.

Dr. Good says—I quote to contrast, not to commend his treatment: 'As soon as the patient is capable of swallowing, some spirituous cordial, a glass of wine, brandy and water, fetid tincture, or the aromatic spirit of ammonia, or of ether, should be administered." The reader need not be told that a half gill of pure soft water is an ample substitute for all of the above allopathic notions.

MORBID SIGHT.—Ingenious nosologists have certainly displayed more analytical than philosophical talent in giving us a list of *nearly six hundred* diseases of the eye. Dr. Good has reduced the formida-

list to *twelve*; but I think *one* will answer just as well for all the forms of depraved vision which do not properly belong to the special chapter on diseases of the eye.

Symptoms.—In *false sight* or *illusory vision*—the only species coming within our generic definition—imaginary objects float before the eye, or real objects appear with imaginary qualities, constituting the *ocular specters* and the *muscæ volitantes* of authors. In many cases of false sight, objects appear of unusually large or small sizes, or multiplied in number; one color is mistaken for another; sparks and flashes of light appear before the eyes, etc.

Special Causes.—Excess of light, plethora, local injuries, as blows, bruises, congenital malformations.

Treatment.—But little can be done therapeutically beyond attention to the general health. Gentle friction and manipulation, frequently holding the eyes in cold water, etc., as in the case of weak eyes, or sore eyes from debility, are occasionally serviceable. It is especially important in all cases of depravity of the special senses, that grease, salt, and all earthy or saline matters be excluded from the food and drink.

Morbid Hearing.—Preternatural acuteness or obtuseness, or disordered perception of sound, results from a variety of inflammatory states or structural changes of the ear. But in some instances the hearing has been so keen as to render the ordinary whispering, and even the respiration of persons present highly distressing, and to render real, imaginary, or illusory noises exceedingly troublesome, or so dull as to disable the patient from taking part in common conversation, without any apparent local affection of the auditory apparatus; although in most cases it is presumable that a deficiency of the ceruminous secretion, or an unnatural irritability or torpor, resulting from powerful noises, violent passions, etc., are the conditions on which the depravity of the function depends. In some cases of semi-paresis, or partial palsy of the auditory nerve, the ear is only sensible of articulate sounds, when excited by louder sounds intermixed with them; and in some cases particular sounds, as the beating of a drum, the rattling of carriage wheels, the tones of a shrill pipe, the ringing of bells, etc., will excite the function and enable ordinary conversation to be recognized.

Treatment.—Remedially, we can only attend to the secretion of the external ear, and to the general health. Frequently syringing the external meatus with warm or tepid water, followed by cool or cold, and the occasional employment of the head-bath, with a moderate douche to the upper portion of the spine, are the appropriate local measures

MORBID SMELL.—Acrid, obtuse, and absence of smell are, like analogous conditions of the other senses, usually among the symptoms of fevers and local affections. But with some an extreme and painful keeness or total deprivation of the sense exists from birth. Some persons find the smell of roses, and various odors and perfumes which are agreeable to the majority, intolerably offensive and sickening. A temporary loss of smell may result from a slight cold; and a permanent depravation or deprivation of the sense is often produced by irritants, pungents, errhines, and poisonous vapors, as "cephalic snuffs," tobacco dust, cigar smoke, etc. Catarrhal affections, when long continued, always deteriorate the sense, and all high-seasoned dishes and complicated preparations of animal food, are especially injurious.

Treatment.—The head-bath, and the frequent sniffing of cold water up the nostrils, with a rigidly simple diet, constitute the special therapeutic measures.

MORBID TASTE.—The tongue and palate, which in the normal state distinguish the chemical and gustatory qualities of substances, as sour, sweet, bitter, rough, aromatic, saline, etc., are sometimes so malformed originally, or so perverted by disease or bad dietetic habits, as to be painfully acute or morbidly obtuse; to remedy which nothing is more appropriate than frequently holding cold water in the mouth and employing an exclusively farinaceous and fruit diet, the farinaceous part to be as simple and dry as possible, of which unleavened brown bread is the best specimen.

MORBID TOUCH.—The hand, and especially the extremities of the fingers, possess the nicest power of discriminating the tangible properties of bodies, although the whole skin belongs to the organ of feeling, or sense of touch; and this sense, like all the others, may be preternaturally acute, or insensible, or illusory. Its principal deviations from the normal condition are known as *soreness*, *itching*, *heat*, and *coldness*. The first variety is usually the result of a cold, or a symptom of fever or inflammation; the second is dependent on irritation in the stomach, bile in the blood, or imperfect depuration from the skin; and the third and fourth are caused by exercise, and alternations of, or exposures to, extreme temperature. Beyond a daily cold-bath, and attention to any particular local derangement that may chance to exist, we have nothing to say remedially, except advise a regulation of all the voluntary habits according to the laws of health.

CHAPTER XVI.

MENTAL DISEASES.

The relation between mind and body is so intricate and intimate that a morbific impression upon either may produce a manifestation of morbid phenomena in the other. The majority of cases of insanity, lunacy, hallucination, or mental aberration, have their origin in bodily disease; yet there are some cases in which the producing cause is purely mental. The present chapter comprises a group of maladies whose most prominent symptoms are abnormal manifestations of the mental operations, irrespective of the nature of the predisponent, proximate, or exciting causes. They may be arranged in tabular form as follows:

Insanity	Melancholy, Madness.	Revery	Absent-Mindedness, Mental Abstraction, Brown Study
Ungovernable Passion	Fury, Despondency, Hair-Brained.	Sleep Disturbance	Somnambulism, Sleep-Talking.
Hallucination	Sentimentalism, Hypochondriacism.	Fatuity	Irrationality, Imbecility.

Insanity—Craziness.—Nothing in the whole range of pathology is more difficult than a nosological arrangement of the abnormal states of mind; for the vast diversity of human intellect, and the varied circumstances of excitement, depression, and mis-direction to which it is subjected by individual and social uses and abuses, make it sometimes impossible to say where sanity ends and insanity begins; while among the unquestionably insane we find every conceivable shade and degree of mental peculiarity, from a disproportionate activity of a single faculty or propensity, constituting a *one-ideaism* or an *all-absorbing passion*, whose possessor is merely a *monomaniac*, to the most violent and extreme derangement of several or of all the mental powers, constituting craziness, lunacy, or idiocy.

The malady before us presents two distinct features, which authors have ranked as species of disease: *melancholy*, in which there is a total or partial hallucination, accompanied with extreme dejection, fear and false apprehensions, while the will is wayward and domineering

and *mania* or *madness*, in which all the mental powers are greatly excited, and the discrepance between perception and judgment general. Melancholy is subdivided into many varieties, as *gloomy melancholy*, when the patient is mute and retiring; *erratic*, when he is roving and restless; *malevolent*, when he is morose or mischievous, and disposed to injure himself or others; and *complacent*, when he is quiet, affable, and visionary. Madness is characterized as *furious*, when the patient is violent, runs, jumps, mutters, cries, shrieks, etc.; *elevated*, when he is gay, lively, hurried, exulting in his own imaginary importance, which may make him a president, king, prophet, or the Messiah; *despondent*, when he is abjected and depressed; and *demented* or *chaotic*, when the mind sinks into insensibility and forgetfulness, with an entire abolition of the faculty of judgment, yet possessed of unconnected and evanescent emotions, and perpetually active in acts of extravagance without object or design.

Special Causes.—It is natural enough that physicians, considering how few are the sound physiological principles known in the schools of medicine, should suspect some morbid condition of the brain or its appendages as the special cause of all diseases which are characterized by disorderly manifestations of the mental functions. But says Dr. Good: "Concerning therefore the remote or even proximate cause of the disease, we have yet much to learn. From the view we have taken in the proem of the close connection between the mind and the brain, it seems reasonable to conceive that the remote cause is ordinarily dependent upon some misconstruction or misaffection of the cerebral organs; and hence every part of them has been scrutinized for proofs of so plausible an hypothesis, but hitherto to no purpose whatever. The form of the cranium, its thickness, and other qualities; the meninges, the substance of the brain, the ventricles, the pineal gland, the commissures, the cerebellum, have all been analyzed in turn by the most dexterous and prying anatomists of England, France, Germany, and Italy, but with no satisfactory result."

As well might we expect to find the proximate cause of a disorderly communication or action of the telegraphic machinery, by a chemical analysis of the wire between the batteries or at the stations, as to seek the cause of diseased mental manifestation in an analysis of the anatomical character of the brain. The nervous influence and the electric fluid will probably forever elude all attempts at material analysis.

That the phenomena of insanity immediately depend on some excess or defect, or mal-distribution of nervous influence, is sufficiently obvious; nor is it difficult to ascertain the ordinary, remote, or disturbing causes; these are generally strong mental emotions, operating in con-

nection with an organism physiologically unsound. Intemperance is *the* most frequent cause. Gluttony, self-abuse, powerful stimulants, religious excitement, grief, fear, disappointment in objects of love, ambition, or property, reverse of fortune, etc., are named by authors among the ordinary causes.

Treatment.—The *moral* management will be readily suggested by the circumstances of each case. Undoubtedly a well-ordered public asylum is the proper place for the majority of becrazed invalids. But there the *medical* part of the management could be vastly improved Instead of bleeding and drastic purgatives, which, as the late Dr. Brigham, of the Utica Asylum, testified, only serve to fasten the insanity upon the patient, he should be put upon a bland and simple diet, and a plan of derivative and soothing bathing. In all the appliances of water, especial pains must be taken to keep the feet warm, the head cool, and to avoid all sudden shocks or strong impressions which would produce cerebral excitement. The tepid, shallow, hip, and foot-baths are the leading processes. When the patient is manageable, the wet-sheet pack, followed by the dripping-sheet, is appropriate; but when these or any other general cold bath is employed, care must be taken to have the feet warm; if they are in the least inclined to coldness, they should be put in warm water both before and after the bath.

In our public institutions, insane persons are allowed flesh-meat, coffee, tea, condiments, and sometimes ardent spirits and tobacco—all of which is clearly wrong.

Ungovernable Passion.—This affection, in which the judgment is overpowered by some predominant or ruling passion, accompanied with a marked change of the features and countenance, is seen under the forms of *excited*, *depressed*, and *fitful* or *eccentric* passion. The divisions of the first are innumerable, as *ungovernable joy*, *self-love* or *self-conceit*, *pride*, *ambition*, *anger*, *jealousy*, etc., all of which are marked by a lively, quick, daring eye, and a flushed, tumid face. In the second variety the patient is anxious, pensive, inclines to solitude, and his countenance is pale and furrowed; the ruling passion is manifested in *ungovernable love*, *avarice*, *anxiety*, *longing*, *heartache*, *despair*, etc. The third variety is commonly called *hair-brained passion*, and is characterized by wayward and unmeaning passion, indiscriminate acts of violence, and a hurried and tumultuous manner; it is usually the result of an ill-directed education.

Special Causes.—All the causes of insanity may be among the predisposing or exciting causes of the species of menta. pravity under consideration · to which may be added debauchery, gambling, ingratitude.

domestic trouble, loss of friends, crushed hopes, love-sickness, home-sickness, impending calamities, successive misfortunes, social disgrace, incurable secret diseases, bodily imperfection or deformity, contumely, imprisonment, banishment, remorse, etc.

Treatment.—To all the remedial measures named as applicable to insanity, should be added as far as practicable, recreation, occupation, and society. Probably nothing is more reforming to the mind or renovating to the body, in all forms of the malady before us, than regular, steady employment in some *useful* calling.

HALLUCINATION—ILLUSION—ALUSIA.—In this affection the imagination overpowers the judgment. It embraces two varieties, one of which is called *sentimentalism*, or *mental extravagance;* and the other is termed *hypochondriacism*, or *low spirits.* The former is characterized by romantic or fantastic ideas of real life, ardent fancy, excited and pleasurable feelings, and animated countenance; it embraces those forms of mental illusion, called *heroic* or *chivalrous*, *facetious*, *ecstatic*, and *fanatic;* in other words, *romantic gallantry*, *crack-brained wit*, *false inspiration*, and *fanaticism.* The *hypochondriac* variety is distinguished by gloomy ideas of real life, dejected spirits, anxiety, indisposition to exercise, an oblique and scowling eye, sad and sullen countenance, with a languid pulse, and prominent dyspeptic symptoms; it comprehends the mental states known as *vapors*, *weariness of life*, and *misanthropy*, or *spleen.*

Symptoms.—Morbid sentimentalism manifests every conceivable form of extravagant mis-judgment, as uncalled-for acts of gallantry, rampant and unrestrainable jesting, ecstasy, visions, belief in apparitions, or in some preternatural endowment, etc.

Hypochondriacism perceives a thousand evils and accidents which have no existence, and imagines the most whimsical and groundless causes of disquiet, as personal danger, poverty, frogs or geese or other animals in the stomach; all sorts of diseases; one perceives himself transformed into a giant; another into a dwarf; one is as heavy as lead, and the other as light as a feather; some suspect their friends of an intention to murder them, and others suspect themselves of having murdered their friends; they are peevish, pleased and displeased with the veriest trifles, and are often unwilling either to live or die.

Special Causes.—The first variety is often, if not generally, attributable to a superficial and ornamental instead of a substantial and useful education. Novel reading is, perhaps, the most potent and most common cause. "Perilous adventures, love-lorn catastrophes, the stories of magicians knights enchanted castles, imprisoned damsels, melting

minstrelsy, tilts and tournaments, and all the magnificent imagery of the same kind that so peculiarly distinguished the reign of Elizabeth, became a very frequent source of permanent hallucination." The second variety is more especially connected with indigestion and disease of the liver; and among the common causes are alcohol, tobacco and intemperance and stimulation generally.

Treatment.—In addition to the measures requisite to recover and maintain general bodily health, the moral or mental medication should consist of pleasant, cheerful, and *sensible* company, with a light and easy, yet regular and steady business occupation, occasionally diversified by reading sound, scientific, useful, and practical books and newspapers.

Note.—Some authors name displacement of the transverse colon as a cause of various forms of insanity; and the French pathologists are said to have frequently found this condition to exist, on post-orbit dissections, more especially in subjects who have died of the varieties of hallucination called *weariness of life* and *misanthropy*. I am of opinion some kind of structural derangement of some portion of the intestinal tube is a much more frequent cause of mental aberration than is generally supposed. I have very often noticed a less degree of the same misaffections of mind, and also many extreme cases of those forms of hallucination termed *fidgets*, *anxiety*, *vapors*, etc., in persons suffering from a displacement of the lower bowel—prolapsus of the fundament. This is generally induced by piles; piles are uniformly caused by costiveness, and the ordinary dietetic habits of civilized society are exactly calculated to produce this diseased condition. Hence there is good reason to apprehend that a great proportion of those cases of mental disorder coming under the present head, are owing to diseases or displacement of some portion of the digestive canal.

But I have noticed another still more frequent cause of still severer forms of "a mind diseased," and I wish to give it particular prominence here, for the reason that it is scarcely alluded to in any medical work with which I am acquainted, in connection with the general subject of insanity. I mean displacement of the uterus. The reasons already assigned show us why this malady should be of frequent occurrence among females. They are more sedentary and in-door in their habits and occupations, and hence more liable to constipation, piles, prolapsed bowels, etc., and the general debility and relaxation of fibre often extends to the uterus and its appendages, producing prolapsus, anteversion, retroversion, and a variety of other local complaints. These cases require the special treatment which will be mentioned hereafter.

REVERY.—*Absence of mind*, *mental abstraction*, and *brown study* are the usual forms in which the misaffection of mind, termed revery, is exhibited. They are sometimes induced by bodily infirmity, but are more frequently the acquired habits, resulting from a loose, irregular, and superficial education—an education in which the mind is stuffed with words instead of being taught to think and form ideas for itself. This, combined with corporeal inactivity or indolence, is the principal reason why so many college-bred sons of distinguished men, after receiving the highest finish of a *formal* education, and being "put through" a learned profession—law, physic, or divinity—in the offices of the most eminent professors, turn out wordy blockheads or professional automatons, instead of thinking men and intelligent citizens. These remarks apply mainly to the first variety of revery.

It should be remarked, however, that some overwhelming passion, and intense study, especially upon the principles of mathematics and other abstruse subjects, are not unfrequently causes of mental abstraction, while these causes, coupled with the pursuit of some object of ambition or emulation, in which the mind is kept for some time in a state of distraction between hope and fear, frequently induce the variety called brown study—the *studium inane* of Darwin.

The treatment will be readily inferred from the general principles of cure indicated in the preceding remarks.

SLEEP-DISTURBANCE.—*Sleep-walking*, *somnambulism*, and *sleep-talking* are terms which denote the forms, and sufficiently express the nature of the chief varieties of mental disorder connected with sleep. There is in all cases an imperfect and disquiet rest, in which some of the mental powers are but partially asleep. The usual, and perhaps only causes, are an irritated or overloaded stomach, and an overexcited brain. Profound or natural sleep is never accompanied with walking, talking, or even dreaming; hence all the phenomena resulting from disturbed sleep are so many symptoms of abnormal bodily or mental irritation. Worms in the alimentary canal, and diseases of the brain, are peculiarly distinguished by somnambulific manifestations. In some cases of somnambulism, which have been clearly traced to morbid, digestive, or cerebral excitement, and cured by appropriate remedies; the mental powers have been wrought up to high intensity of power, and have solved problems too difficult for the waking state; and persons in such conditions have even been known to exercise clairvoyant powers, as in reading with the eyes shut and closely bandaged, hearing and conversing coherently while entirely unconscious, etc., while the voluntary muscles, unaided by the external senses, have performed

various feats of locomotion, as climbing, walking securely in the most dangerous places, etc., which could scarcely have been accomplished unless the "interior sense" had predominated over the special senses.

Our success in medicating these affections will depend entirely on our skill in tracing each individual case of disturbed sleep to its particular cause or causes, and applying our remedial measures according to the principles already explained.

FATUITY.—The definition of this affection by Dr. Good, "defect or hebetude of the understanding," is rather too diffuse; for some people are considerably prone to regard all others as in some way or other defective or foolish in judgment, who happen to feel, think, or act otherwise than according to their own standard of a sound understanding.

That form of mental hebetude which is known as *imbecility*, is divided by authors into various forms, the chief of which are *stupidity*, *forgetfulness*, *credulity*, and *feebleness*; while *irrationality* or *witlessness* comprehends those manifestations of defective reasoning faculties we call *folly* or *silliness*, *dotage* or *superannuation*, and *idiotism*. Of course we must all humbly and modestly confess to some degree of some one or more of these "hebetudes;" but it is only when they are found to form a very prominent feature of a very small minority, that we are to name them as leaves or branches of the great *arbor morborum*.

Stupidity may arise from ignorance, from gross food or gluttony, from idleness, from intoxicating drink, from tobacco, etc. A celebrated author remarks, "Idleness in conjunction with wine and fermented liquors, has a proverbial power in besotting the understanding." Forgetfulness affords many curious examples of oblivious reminiscence. Some forget the place or street they live in; others cannot always pronounce their own name at the post-office; and instances are recorded in which individuals have forgotten their mother tongue, and been obliged to re-learn the language from the alphabet. Credulity may result from misdirection or original malformation; and it exhibits all degrees of imbecility, from a trifling gullibility to a disposition to take hold of subjects with a fervency of faith proportioned to their intrinsic absurdity. Silliness is sometimes a natural infirmity, and frequently the fruit of bad company and low associates in early life. Dotage is usually considered as a mere consequence of old age, but is generally hastened on and aggravated by riotous living or excessive labor, or the habitual indulgence of violent passions. Idiotism generally results from defective organization, or a want of that portion of the brain which manifests the reflective faculties It may, however, be induced by a va

riety of accidental circumstances or voluntary habits, as habitual drunkenness, excessive indulgence in enervating pleasures, onanism, or self-pollution, violent and protracted emotions of mind, external injury of the brain, loss of blood, etc. It has been produced by the excessive use of the lancet in females after delivery, in brain diseases, and in various forms of insanity.

Treatment.—So far as moral treatment can be of any avail, the principles which should regulate it have already been indicated. In relation to the medical, much may be done to alleviate or cure those cases not depending on congenital or organic causes. In general terms, the treatment should be rather of the rousing, stirring, animating kind; as the dripping-sheet, douche, shower, plunge, spray, or fountain, cataract-baths, etc., combined with active out-door exercise, or regular occupation. The diet should always be simple, bland, rather abstemious, and strictly vegetable. An irrational mind, or one predisposed by organization, accident, or bad habits, to imbecility in any form, should avoid flesh-meat as if it were a very bohon upas.

CHAPTER XVII.

DISEASES OF THE VOCAL AVENUES.

All the diseases which make up the present chapter, have, as their most prominent symptom, some misaffection of the voice or speech, although some of them differ very greatly in every other particular. They may be thus grouped:

Chronic Catarrh	Acute, Chronic, Ozæna.	Speechlessness	Elingual, Atonic, Deaf-Dumbness.
Polypus	Compressible, Cartilaginous.	Dissonant Voice	Whispering, Immelodious, Of Puberty.
Rhonchus	Snoring, Wheezing.	Dissonant Speech	Stammering, Misenunciation.

Catarrh—Coryza.—When this affection is confined to that part

of the mucous membrane which lines the nasal cavities, it is called *cold in the head;* and when the inflammation fixes permanently upon the same membrane in the cavities of the frontal bones, it is called *catarrh in the head.*

Symptoms.—In the *acute* form there is a defluxion of acrid, pellucid, mucous, or ropy matter from the nostrils, with a sense of irritation, and some degree of general fever. In the *chronic* variety the discharge is limpid, without acrimony or irritation, and unattended with febrile disturbance. The third variety, which is produced by an *ozæna*, or nasal ulcer, is denoted by an offensive, purulent, or ichorous defluxion; it is often connected with caries of the spongy bones.

Special Causes.—Sudden exposures to cold and damp, hot drinks, irritant dust or vapors, snuff, smelling salts, strong aromatics, mercurial salivation, often induce this disease. Some authors give us a *senile* variety, owing to "the *natural* paresis of old age;" but I hold that any local palsy before death is entirely *unnatural.*

Treatment.—The acute form requires a few packs to reduce the general feverishness, which, if the diet is rigidly abstemious, and the patient kept in a moderately warm room of uniform temperature, will effect a cure in a very few days. The chronic variety—as also does the nasal ulcer—requires a persevering employment of derivative as well as local treatment. The pack occasionally, frequently sniffing cold water up the nostrils, the hip-bath, and one or two foot-baths daily, with as much exercise in the open air—avoiding, however, chilling and damp winds—as the patient can comfortably bear, comprise the remedial course.

Polypus.—Polypus tumors in the nostrils are of two kinds; the *soft*, or *compressible*, and the *hard*, or cartilaginous. Both are probably morbid growths of the mucous membrane, although the latter variety is generally connected with caries of the ethmoid or inferior turbinated bones.

Symptoms.—Nasal polypi present the appearance of fleshy, elongated excrescences, attached by a slender neck to some part of the Schneiderian membrane, extending in different directions, and affecting the speech by obstructing the nasal cavities. The soft kind is unattended with pain; its color is a pale red, having some resemblance to a common oyster; and it generally shrivels in dry and enlarges in wet weather. The hard polypus is firm, of a highly red or dark color, progresses gradually without alternate diminution and enlargement, and causes pain, with a very disagreeable sensation in the nostril and forehead, on coughing, sneezing, blowing the nose, etc.

Treatment.—In the early stage frequent sniffing of the coldest water will often arrest the tumor. When it becomes troublesome from bulk, extirpation is necessary.

The soft kind may be removed with the ligature or forceps; the latter is generally the most convenient method. The hard polypus cannot always be meddled with without endangering the life of the patient. When attached to or connected with the spongy bones, these may be removed by a skillfu surgeon.

RHONCHUS—RATTLING IN THE THROAT.—*Snoring* and *wheezing*, which are the chief varieties of this affection, are symptomatic of other diseases, as apoplexy and asthma, or of gross feeding, a plethoric habit, corpulency or obesity, or of an obstructed skin, by which the lungs are oppressed with vicarious duty, or of atony or debility of the abdominal muscles, which are important agents in the respiratory movements. The cure will be found in a restoration of that equilibrium in the bulk and action of the bodily organs and functions which is correctly termed health. Dr. Good recommends "taking off the obesity," in fat persons, "by repeated venesections, active purgatives, vigorous exercise, and a low diet." I will guaranty a perfect cure in every case of obesity on earth, by proper exercise and diet, *sans* all the bleedings and the purgatives.

SPEECHLESSNESS—APHONIA—DUMBNESS.—Inability of speech may result from destitution of tongue—and this may be congenital or accidental—constituting the *elingual* variety; or from paralysis of the nerves of the tongue or glottis, in consequence of some violent injury or shock, forming the *atonic* variety; or from congenital deafness, or deafness acquired in early life, making the variety called *deaf-dumbness.*

Special Causes.—When the inability is not organic, its most frequent causes are severe and protracted colds; violent shocks, as of lightning or electricity; vehement emotions, as of terror, anger, fright, narcotics; mephitic exhalations; poisoning from eating mushrooms, and sometimes shell-fish; metallic vapors; mercurial medicines, etc. There are also many cases of partial or complete loss of voice, the cause of which is almost always overlooked or unthought of by the attending physician: I mean cases of weak voice resulting from mere debility of the muscles of the loins and abdomen. In these cases there may be a moderate degree of general health, with an extreme relaxation or rigidity of these muscles, so that the balance of action between them, the diaphragm, and the laryngeal muscles, is lost; the diaphragm descending when it should ascend, and *vice versa.*

Treatment.—We have no special remedial resources in the majority of cases which depend on incurable malformations or structural lesions; nor can we in the majority of cases dependent on functional derangement, do more than attend carefully to the general health, trusting nature for the local medication. In that form, however, dependent on muscular debility, we can invigorate the affected muscles by the wet compress, frequent hip-baths, various manipulations, as kneading, pounding, thumping, and a variety of exercises which call the weakened muscles into vigorous play, as dancing, jumping, riding a hard-trotting-horse, and vocal gymnastics, as reading, speaking, and declaiming by the elementary sounds of the letters or words, etc

Dissonant Voice.—The chief depravations of voice have been ranked under the heads of *whispering*, in which the voice is weak and scarcely audible; *immelodious*, when it is habitually rough, nasal, squeaking, whizzing, guttural, or palatine; and the irregularly alternating harsh and shrill voice which is peculiar to the period of *puberty*.

Special Causes.—The last named variety can hardly be regarded as a disease, save when complicated with some accidental abnormity. The other varieties are caused by most of the circumstances which produce the atonic loss of voice, to which may be added over-exerting the vocal apparatus, as in loud speaking or singing, or in straining the voice while the bodily attitude is crooked or distorted, or when the abdominal muscles are so weakened that the main effort at expulsion is thrown upon the muscles of the throat, chest, and diaphragm. Indeed, a misuse of the respiratory muscles, or in other words, a vicious habit of exercising the voice in early life, which has its origin in bad training or bad health, is the most common cause of unharmonious, unmusical, and unpleasant voices in after life.

Treatment.—The special management in all forms of voice wherein there is no "concord of sweet sounds," consists, in addition to such appliances as particular complications may demand, in a regular system of voice-training or vocal gymnastics. Ordinary ingenuity will suggest a thousand variations of the general plan to suit individual cases; but this general plan is, 1. An erect bodily position; 2. Opening the mouth freely and fearlessly in every attempt to read or speak; 3. Reading and speaking slowly, and pronouncing every syllable distinctly, and even giving every letter its full and appropriate sound; 4. Pronouncing the different elementary vowel and consonant sounds of our language, at first slowly, and then as rapidly as possible, taking care to have every sound distinctly enunciated; 5. Hallooing with a full prolonged sound, as by the word over: 6. Laughing by pronoun-

ing hah-hah-hah as rapidly as possible, observing that the abdominal muscles contract—that is, spring out, as it were—at every enunciation; 7. Declaiming on the sea shore in the face of a strong wind, with pebbles in the mouth, *a la* Demosthenes, etc.

Dissonant Speech.—*Stammering* has been called a sort of St. Vitus's dance of the vocal organs. Its principal varieties are called *hesitating*, in which there is an involuntary and tremulous retardation in the articulation of peculiar syllables; and *stuttering*, which is an involuntary re-pronunciation of some syllables or words, alternating with a hurried and convulsive pronunciation of those which follow.

Misenunciation is that form of imperfect speech in which the sounds are articulated freely, but inaccurately pronounced; the principal varieties of this affection are vicious or incorrect pronunciation of the letters *r* and *l*; substitution of soft for harsher letters; multiplication or omission of labials, or exchanging them for other letters; misemployment of dentals, and mispronunciation of gutturals.

All of these errors and imperfections of voice are sometimes the result of organic malconformation; occasionally, as in the case of stammering, of a constitutional irritability of some of the muscles concerned in articulation; more frequently of a want of correct education; and still oftener of a careless or depraved habit; and even in some cases of an exceedingly silly affectation. Many stammerers who talk with great difficulty, read with great facility, and all of them stammer most when they undertake to speak most deliberately, and least when their attention is so engrossed with the subject that they think nothing about picking out single words, or arranging sentences with a view of obviating the infirmity of speech.

Treatment.—All that has been said in relation to the vocal treatment of the preceding disease, applies with equal force to this. The stammerer cannot well be too slow and deliberate in his voice exercises, nor should he attempt much conversation while under the remedial discipline, and he must exercise also the mental qualities of firmness and perseverance. Every expedient which he can devise to expand the lungs and augment their retentive capacity, will facilitate his improvement; as, for example, deep, full, and prolonged inspirations and expirations, during which he may to advantage count one—two—three—four, etc., taking pains to open wide the mouth, and "speak loud and plain" each monosyllable he attempts to utter. The various forms of misenunciation, besides the vocal exercises herein intimated, could with propriety be referred to a judicious course of lectures on elocution, nor would the lessons of the singing master be without value.

CHAPTER XVIII.

DISEASES OF THE SEXUAL FUNCTION.

The integrity of the function whose morbid affections we are about to consider, in its importance to the progressive improvement and well-being of the human race, cannot be over-estimated; yet, unfortunately, with regard to several diseases comprised in the present chapter, we have to regret, as in the case of several preceding maladies, that they are alarmingly on the increase. This is especially the fact in regard to those female diseases known as mismenstruation and prolapsus—diseases of rare occurrence in the days of our grandmothers, and then scarcely known, except in the married relation; but now prevalent among all classes and all ages of females above mere infancy. These complaints are attributable to four general classes of causes; sedentary habits, concentrated and stimulating food, enervating drinks, and unphysiological dress; and as the refinements, and luxuries, and bad fashions of society increase, these natural and necessary consequences must extend correspondingly.

It is a painful reflection, too, on the popular medical system of the day, that its professors, who claim to be the conservators of the public health, content themselves with dosing and drugging, bleeding and poisoning, and talking technicalities to this class of invalids, instead of teaching them how to live healthfully. Soundness and purity in the reproductive organism are indispensable to a perfect and vigorous organization in the offspring of sexual intercourse; and if mothers and daughters could be imbued with the right moral principles and physiological truths, there would soon be an end to these artificially produced, but not the less afflictive and lamentable disorders, which are presented in the following tabular arrangement:

Mismenstruation
- Obstructed Menstruation—Amenorrhœa,
- Laborious Menstruation—Dysmenorrhœa,
- Excessive Menstruation—Hemorrhagic,
- Vicarious Menstruation,
- Irregular Cessation of the Menses,
- Chlorosis—Green Sickness,

Leucorrhea. Spermatorrhœa.

Venereal Diseases	Syphilis, Gonorrhœa, Gleet.	Inordinate Lust	Satyriasis, Nymphomania
Genital Displacement	Prolapsus, Anteversion, Retroversion, Inversion, Excrescence.		

MISMENSTRUATION.—The catamenia secretion may be obstructed in its discharge, laborious and painful at the usual period, excessive in quantity, vicarious in its locality, irregular in its final cessation, or attended with general derangement of health at the period of its first appearance, which several circumstances constitute the several species of the disease before us.

Symptoms.—Obstructed menstruation—the *amenorrhœa* of authors—is distinguished into *retention* when the menstrual flux is obstructed at the period of its accession; and *suppression*, when the obstruction occurs regularly at the usual periods of recurrence. The former variety is characterized by an œdematous swelling of the feet and ankles at night, and a swelling of the eyes and face in the morning; the latter is attended with headache, difficult breathing, and palpitation. Both varieties are attended with general languor and many dyspeptic symptoms, particularly a capricious appetite, and not unfrequently a longing for innutrient and injurious substances, as clay, slate-stone, charcoal, etc. In many cases there is a harassing cough, with symptoms of a general decline.

In *laborious* or *painful* menstruation—*dysmenorrhœa*—the flux is accompanied with great and sometimes excruciating pain, not unlike the bearing-down pain of labor, generally attended with some degree of actual hemorrhage, and frequently with an expulsion of fragments of a membranous concretion, like that of croup or tubular diarrhœa. In some instances this membranous concretion is thrown off from the entire surface of the uterus at once, in the shape of a small bag filled with a fluid which has been mistaken for an early abortion.

In *excessive* menstruation the catamenial secretion is superfluous in quantity, and attended with an actual hemorrhage from the menstrual vessels. The hemorrhage is known by the fact that the fluid discharged is coagulable, which is not the case with the pure catamenial flux. It exhibits two subvarieties, in one of which the discharge is excessive, from too frequent recurrence, and in the other from too copious a flow at the proper menstrual period. The ordinary flux may be from four

to six ounces, but it is subject to much diversity, and can only be regarded as morbidly in excess when accompanied with marked symptoms of general debility, as paleness, cold extremities, œdematous feet, fatigue on slight exercise, etc.

Vicarious menstruation is characterized by a transfer of the catamenial secretion to a more distant part or organ. The eyes, nostrils, ears, sockets of the teeth, nipples, stomach, lungs, rectum, bladder, and abraded or ulcerated surfaces, have been the seat of the transferred flux.

The *irregular cessation* of the menses, at the term of its natural cessation—usually called the *turn of life*—which in this climate is, on the average, at about the forty-fifth year, is accompanied with symptoms of spurious pregnancy, dropsy, or glandular tumors; the menstrual discharge is irregular; sometimes profuse with long intervals; and at others trifling in quantity, but returning every ten or twelve days, and often succeeded by leucorrhœa.

Chlorosis, or *green-sickness*, though elevated to the rank of a generic term by some authors, is merely a condition of imperfect or deficient menstruation, occurring about the age of puberty, and complicated with so great general debility that the sexual power or propensity is partially or completely lost. The name is derived from the pale, livid, and greenish cast of the skin, which all chlorotic patients manifest more or less.

Special Causes.—In addition to the general causes already intimated, mismenstruation may be induced by repeated colds, especially from an exposure of the feet while the rest of the body is well clad, protracted anxiety, grief or fear, local injury, masturbation, excessive venereal indulgence, repeated miscarriages, etc. Retention of the menses is sometimes owing to an imperforate hymen, requiring for its cure a transverse section of the membranous obstruction.

Treatment.—Fortunately almost every form, state, and stage of mismenstruation is curable by the thorough application of our whole system. The majority of cases, however, require several months', and many of them two or three years' treatment to complete the cure But fortunately, again, those cases which require a long treatment, can be managed mostly at home, and with very little expense or neglect of ordinary duties or labors. The general plan applicable to all forms of the disease except excessive menstruation is, a morning full-bath, as the plunge, dripping-sheet, or towel-wash, two or three hip-baths daily, one or two foot-baths, the abdominal bandage, frequent and varied outdoor exercise, and a plain, solid, rather dry, and unstimulating dietary. The water should in all cases be as cold, yet no colder, than is followed

by quick reaction and a comfortable glow; and, as a general rule, short baths, frequently repeated, are more efficacious than long ones with greater intervals. Hip and foot-baths should always be preceded and succeeded by active yet not exhausting exercise, and the walking foot-bath, when practicable, is always to be preferred. A great variety of exercises can be advantageously employed, as walking, riding, jumping the rope, dancing, shuttle-cock, graces, etc. And those who can find the same recreation and entertainment in light work, as sweeping, dusting, spinning, washing dishes, picking berries, milking the cows, etc., will find exactly the same remedial effects as from amusing and agreeable plays.

When the body is full, sanguine, and plethoric, the wet-sheet pack should be employed daily or tri-weekly for a month or two; and when the whole system is in the opposite condition, called atonic, anhæmic, torpid, etc., the tepid shallow-bath, followed by active and prolonged rubbing, should be substituted. In cases of excessive menstruation, the hip-baths should be colder than in either of the other varieties, generally from 55° to 45°. In the variety, irregular cessation, care must be taken not to disturb the circulation with any powerful shock; the treatment in the main should be mild, the water generally tepid or but moderately cold. The exercises, too, in the last two varieties, should be very moderate.

Vaginal injections are useful in all cases attended with considerable relaxation, hemorrhage, or leucorrhœa; while in all other varieties, the horizontal douche or spray, applied to the hips, abdomen, and loins, is a valuable auxiliary.

When the catamenial periods are attended with much pain, as in dysmenorrhœa, warm applications must be employed until relief is obtained, after which the regular treatment may be resumed. These should consist of the warm foot-bath, warm sitz-bath, hot fomentations to the abdomen, the full warm-bath or even hot-bath, followed by the dry pack, according to the severity of the pain. In some cases the pain is agonizing for one, two, or three days, and the only endurable condition for the patient is to remain dry-packed, or closely covered up in bed, so as to keep the body warm and perspirable until the secretion takes place. Drinking warm water very freely often proves relaxant and sedative in these cases.

The propriety of suspending a part or the whole of the treatment during the menstrual period, not only in the complaint before us, but in all cases, is somewhat unsettled in the code of hydrotherapia. Some practitioners, at least in all ordinary cases, pay no regard to the monthly flux, while others suspend all active or very cold treatment. It is true

the menses are frequently partially suppressed or wholly suspended for several months by the former practice, yet it seldom happens that any permanent injury comes from it. My own opinion, derived from considerable attention to the practical point under consideration is, that patients who are not much reduced in flesh, blood, or temperature, can take full treatment through the catamenial disturbance, not only without injury, but often with benefit; but that those who are emaciated, pale, and cold, with torpid livers and clogged up skins, and a tendency to headache or "rush of blood to the head," will be better off to take no treatment, save a tepid wash-down daily, and such local soothing appliances as particular exigencies call for, from the first decided indications of the menstrual effort, until it has nearly or quite subsided. There are few diseases in which regimen should have a greater prominence among the curative measures. With respect to water drinking, I have always recommended those of full habit and well expanded lungs to drink rather freely—four, six, or eight tumblers daily—and the thin and feeble to take two or three tumblers in the fore part of the day, and at other times only according to actual thirst. The diet cannot well be too strict, and as constipation is almost always connected with mismenstruation, it should have especial reference to this circumstance.

Brown bread, unfermented bread or cakes, cracked wheat or rye meal mush, with a moderate allowance of the best vegetables and good fruits, constitute the best dietetic plan. Very little animal food, if any, should be taken, and even eggs, butter, and milk, had better be avoided.

Leucorrhœa.—This disease is indiscriminately called *fluor albus* and *whites* in medical books. It affects more or less nearly all females who are the subjects of mismenstruation, and sometimes exists antecedently, and at others subsequently to the menstrual period of life. It is most frequently the immediate result of local irritation. It has been for a long time, and is yet a question among medical authors, whether this disease is ever infectious, and communicable to the male urethra by the act of copulation. Two years ago, a "professor of diseases of women and children," in one of our city colleges, and an ex-professor of the same branch in another orthodox school, were called upon in a court of justice, to give testimony on this very point. The latter professor testified that he had actually known such infection to result from leucorrhœa, in his own emphatic language, "again, and again, and again;" while the former declared that he did not believe it was possible! Both medical gentlemen, of course, swore conscientiously. It is a general law in pathology—so general that I believe there are no exceptions—

that all abnormal secretions are bland or acrid, precisely according to the less or greater grossness or impurity, or inflammatory condition of the general system; all morbid discharges from mucous surfaces may become, as is often seen in the case of catarrh or coryza, so acrimonious as to excoriate the surface wherever they come in contact with it; and the mucous surface of the vagina may readily, under circumstances of extreme irritation and high inflammatory excitement, secrete an icherous or infectious matter, which will produce in the male urethra a running analogous to gonorrhœa or gleet, though, of course, not as violent nor inflammatory as in true gonorrhœa, nor infectious like it. I have known cases of this kind under such circumstances as precluded all idea of impropriety on the part of the wife, by whom the husband became diseased. These facts ought to be well understood by the practitioner, so that the woman, though she may not be an example of strict personal cleanliness, may be exempted from the charge of moral impurity.

Symptoms.—The discharge is usually of a yellowish-white color, verging to green; but sometimes it is brownish, or slightly red, varying in consistence from a thin limpid fluid, to a thick, tenacious, ropy mucus. It is usually accompanied with weakness or pain in the back, and some degree of "spinal irritation;" when of long standing, it is attended with a sense of heat, and itching or smarting; and in still more advanced stages, the discharge is highly acrid and offensive, often excoriating the whole surface of the vagina.

In the form called labor, the discharge is slimy and tinged with show of blood, and is only regarded as morbid when excessive. The whites of advanced life generally appear soon after the cessation of the menses; the discharge is thin, acrid, fetid, and excoriating, and is sometimes combined with incipient cancer or polypus.

Special Causes.—The same general range of morbid influences which predispose to, or excite mismenstruation, contribute to the production of leucorrhœa, to which may be added mechanical injuries and irritations, as pessaries, repelled eruptions, voluptuous excitement, and uncleanliness.

Treatment.—Dr. Good remarks, in relation to the drug-treatment of leucorrhœa, "The general remedies which have been had recourse to are almost innumerable;" a sufficient acknowledgment that they have generally proved either useless or injurious. The general hydropathic plan of medication is the same as for mismenstruation. The local treatment requires more especial attention. Hip-baths and vaginal injections are always among the leading measures, and the temperature of the water for either purpose must be regulated by the condition of

the patient. In some cases the diseased surface is so irritable that quite warm water proves the most available sedative. It is always safe and generally necessary to commence these baths with water at 80° or 90°, and gradually reduce the temperature to 60° or 50°. The vaginal syringe in severe cases should be employed two, three, or four times a day. Whenever the discharge is excessive and blood-colored, indicative of actual hemorrhage, very cold water should be thrown up the vagina, and cold wet cloths laid over the abdomen.

SPERMORRHŒA.—Seminal misemission, or an involuntary flux of the seminal fluid without copulation, is often the result of libidinous ideas, especially if to this cause is added the irritation of a gross or highly animal diet, or the still more inflaming and exciting influence of wine, coffee, etc. Not unfrequently the gross and debasing habit of self-pollution, induces such a degree of nervous exhaustion and morbid irritability, that the emission takes place on the slightest libidinous excitement; and sometimes a thin, degenerate, muco-seminal secretion occurs unconsciously during a dreamy or even a profound sleep.

Treatment.—When the general health is fair, and the patient has not been guilty of a concupiscent life, one or two daily cold baths, active out-door exercise, or what is better, regular and laborious occupation, and a plain vegetable and fruit diet, will speedily effect a cure. In constitutions worn down by previous diseases, exhausted by riotous living, or undermined by abused amativeness, the cure requires a strict and persevering observance of all the laws of hygiene, that the patient may out-grow rather than doctor out his ruinous ways. Unfortunately, however, there is no class of patients more fickle, vascillating, and unreliable; the mind partakes of the bodily degeneracy, and it requires a combination of rare and favorable circumstances to keep them from running after every foolish and whimsical impostor who advertizes to cure them with a single bottle of bitters, which, moreover is "pleasant to the taste."

These patients seldom need very active or very cold water-treatment. A daily towel-bath, one or two tepid or moderately cool hip-baths, and a rigidly simple and abstemious diet, afford the best chance of recovery. Salt, sugar, and even milk can be dispensed with to advantage. The evening meal should always be light and as *dry* as possible, and the patient should avoid sleeping on the back, the preferable position in bed being a gentle inclination to one side.

VENEREAL DISEASES.—The affections of the genital organs which result from impure sexual intercourse are among the most loathsome

in appearance and the most deplorable in their consequences that afflict degraded and erring mortals.

Symptoms.—Venereal affections appear in two distinct forms, *syphilis*, or *pox*, and *gonorrhœa*, or *clapp*. The first is a constitutional disease, or, rather, may become so; the second is always a local disease, never extending beyond the genital organs or glands of the groin. Both diseases, however, may coexist in the same individual, and be communicated at the same time. *Gleet* is simply a urethral running; and, though often a sequel of gonorrhœa, may exist from irritation unconnected with venereal taint, and be excited by stone in the bladder, leucorrhœa, and various other causes. These distinctions are important to keep in mind, for thousands have their constitutions ruined by a long mercurial course for gonorrhœa, on the mistaken notion that the disease was in the blood or general system. It should be remarked, too, that syphilis never affects the constitution until after the formation of an ulcer and the absorption of its matter.

Syphilis commences with one or several small pimples, or *chancres*, on some part of the genitals, which gradually fester, and finally terminate in spreading or deepening ulcers, filled with an exceedingly acrid and corroding matter. If this matter is allowed to be absorbed, the glands of the groin swell into hard tumors, called buboes, and often ulcerate. Eventually the whole body becomes contaminated with the virus absorbed from the chancres, and what are called *constitutional* or secondary symptoms appear, as foul ulcers in the throat and palate, livid and copper-colored spots on the skin, or ulcerating scabs, inflamed eyes, pains, swellings, and caries of the bones, etc.

Gonorrhœa—blenorrhœa luodes—consists in a muculent and virulent discharge from the urethra or vagina, attended with a burning pain in passing the water, and considerable, sometimes violent pain, heat, and swelling of the part affected; in some instances the inflammation extends to the glands of the groin, producing buboes.

Special Causes.—Venereal diseases may be generated by promiscuous sexual intercourse, and when produced, the peculiar virus thus developed is capable of propagating the same disease by contact.

Treatment.—The ulcer or chancre should be destroyed by fire or caustic as soon as it makes its appearance. Aqua fortis or lunar caustic may be employed for this purpose. When the ulcer has already spread over a large surface or corroded deeply into the flesh, its virus may be destroyed by repeated applications of a strong solution of the caustic or diluted aqua fortis—one part to six of water. In all other respects both forms are to be treated as ordinary local inflammations. The proper temperature of the water for sitz-baths, which should be fre

quently employed, will vary greatly in different cases; but in all cases that temperature is to be preferred which produces the most sedative or soothing effect. In some cases the morbid irritability is so extreme that cold water aggravates, while warm or very warm quiets the irritation, and relieves the pain and irritation at once.

Inordinate Lust.—We need not dwell long on this affection. Authors have applied the term *satyriasis* to an ungovernable sexual passion in the male; and the term *nymphomania* to a similar propensity in the female. They are both produced by some local irritation, which may have its origin in the general mental or physiological habits of the individual. The most frequent combination of causes which operate to produce a state of lascivious *furor* is, gross, high-seasoned food, intoxicating drinks, indolence, and personal uncleanliness—in other words, inattention to bathing.

These views of the causation of the disease, are supported by the fact that it is more common in advanced life, even beyond the "three score and ten" period, than in youth or middle age. The cure will readily be found in frequent general cold baths, copious water-drinking, active exercise or occupation, warm relaxing hip-baths, and a simple vegetable diet.

Genital Displacements.—The true pathology or proximate condition of these affections is but little understood by the medical profession, as is apparent from the general ill-success attending the ordinary treatment. The term *prolapsus* is used indiscriminately for all degrees of simple descent, or *falling of the womb;* but in some books the term *relaxation* is applied when the descent is only to the middle of the vagina; *procidentia*, when the uterus descends to the labia; and *prolapsus*, when it protrudes externally. *Retroversion* is that form of displacement in which the fundus uteri descends toward the sacrum, the os uteri or mouth of the womb inclining toward the pubes. *Anteversion* is the reverse of the preceding, the fundus falling forward and the os uteri inclining backward. In inversion the organ is turned inside out while in a state of prolapse. In some cases the upper part of the vagina protrudes into the lower, constituting what is called prolapsus of the vagina.

Symptoms.—Prolapsus of the uterus is attended with a heavy, disagreeable, or painful dragging-down sensation at the lower part of the abdomen, aching or weakness about the small of the back, and when severe, great difficulty or inability in walking. At first there is in-

creased mucous secretion, which increases by degrees until it acquires the character of an obstinate leucorrhœa.

When the uterus is *retroverted* the bowels are irregular or constipated, and from the pressure of the displaced organ on the rectum behind and the urethra in front, there is more or less difficulty experienced in expelling the contents of the bowels and bladder. In this situation the womb often becomes congested, inflammatory, and enlarged, and every attempt at walking is exceedingly painful or exhausting. In bad cases the patient can only endure a fixed, quiet, almost motionless position in her chair or bed. There is, too, usually, considerable tenderness and tension of the whole abdomen.

Anteversion is a less frequent occurrence; it is denoted by difficulty in walking, sense of weight or fullness in the pelvis, with many of the symptoms of prolapsus, and is attended with much less difficulty in evacuating the urine and fæces than retroversion.

Inversion is known by the organ hanging down externally; it is usually the result of violence in extracting the placenta, but may occur from an adhesion of the placenta, or from polypus tumors.

In some instances the falling down of the uterus or vagina drags along the bladder with it, constituting what is called *complicated prolapse.* In this case the bladder, being deprived of the expulsory aid of the abdominal muscles, is incapable of evacuating its contents without artificial assistance.

Genital excrescence consists in polypus or other tumors, issuing from the surface of the uterus or vagina. They are of all sizes and of various degrees of consistence, from the softness of sponge to the firmness of leather.

Special Causes.—Although medical authors and professors of midwifery are continually talking about "relaxation of the ligaments" which hold the uterus in position, as the main cause of its displacement, it is quite clear that this relaxation has nothing whatever to do with it; the yielding or elongation of the ligament being itself an *effect* of the displacement. The natural supports of the uterus are the vagina and the abdominal muscles; if the former is greatly relaxed the uterus will descend, and the ligaments, being kept constantly on the stretch, will finally elongate more or less; and if the abdominal muscles are greatly debilitated, they do not contract vigorously, so as to keep up equable and uniform compression in all the various positions of the body, hence the uterus is liable to fall forward or backward, or incline laterally; and when both are badly relaxed and debilitated, we find both conditions of displacement—falling down and tipping transversely across the pelvis. In corroboration of this view of the subject, I may

advert to the fact, that all the cases of uterine displacement we meet with in practice, with the single and rare exception of such as are produced by violence, occur in females who suffer from the very circumstances which are most efficient in inducing muscular relaxation of these parts, as constipation, piles, dyspepsia, nervous debility, mismenstruation, abortions or miscarriages, preternatural labors, etc.

Treatment.—How impotent for good, and how potent for evil, are all the common chirurgical and drug-shop appliances for the management of these cases, may be inferred from the preceding explanation of their nature and proximate cause. Pessaries innumerable have been invented, trusses, braces, and supporters of all sorts and shapes have been contrived, and blisters, issues, and caustics, of every kind, have been resorted to, while many times the miserable sufferer has been kept confined to a fixed position in bed for six months or a year, all intended to aid, force, and sting the "relaxed ligaments" into contraction, but which have, in nearly all cases, operated greatly to the disadvantage of the *relaxed muscles*, and thereby greatly aggravated the difficulty.

A rational medication will abjure all these "evidences of mechanical and chirurgical skill," and regard, first of all, the general health. All the resources of hygiene must be discriminatingly adapted to each individual case. No class of patients require a more rigidly simple and abstemious diet. I have had many patients confine themselves for weeks to brown bread, boiled potatoes, and baked apples, or some plan as simple, and always with the best results. Nothing will conduce more to bring about a firm, energetic, contractile state of the whole muscular system. If a strict diet is adopted, very little water-drinking is necessary. The bathing part of the treatment must in general be moderate, for the reason that most patients can take but little exercise. A daily tepid dripping-sheet or half-bath, with one or two tepid hip-baths, a foot-bath in the evening, with two or three vaginal injections daily, of as cold water as can be borne without disquiet, is the usual combination of baths which are most serviceable in these cases. To these I would always add occasional packs when the patient has a good degree of reactive power or superficial heat and circulation. As in all other cases, the patient should exercise according to ability; but in bad displacements very little can be done in this way until the uterus is restored to its natural position. This must be done mechanically when the ordinary external means fail. The os uteri must be found and elevated, or drawn backward or forward, according to the kind of displacement. While the uterus is in position, the abdominal muscles must be strengthened by active yet gentle manipulations, and the re-

laxed fibres of the vagina constringed by injections of a small quantity of very cold water. The patient should commence walking, or increase her usual amount of exercise, as soon as the organ is replaced, and gradually extend the excursions or gymnastics, as the muscular strength improves. When the uterus is inflamed and enlarged, and the parts painful and tender, the replacement should not be attempted until these symptoms have been partially subdued by the treatment. In some cases an appropriate instrument is necessary to effect the replacement, and when the vagina is extremely relaxed, the uterus will have to be supported with a piece of soft sponge inclosed in a delicate capsule of India rubber, until the requisite muscular contraction can be induced.

The inverted uterus should be restored as soon as possible after the accident which induced it, or its contraction will render the operation impossible. The treatment of the excrescent variety comes within the province of the surgeon; and of the various operations proposed for its removal the ligature is the best.

CHAPTER XIX.

DISEASES OF THE URINARY ORGANS.

The various forms of mismicturition, which consist in morbid secretions or discharges of urine, are:

Destitution of Urine—Suppression.
Retention of Urine—Ischuria.
Painful Urination—Strangury—Dysuria.
Saccharine Urine—Diabetis.
Incontinence of Urine—Eneuresis.
Unassimilated Urine—Urinary Diarrhœa.
Erratic Urination—Vicarious Urination.
Urinary Calculus { Gravel, Stone.

Destitution of Urine.—In this affection the urine is not secreted by the kidneys; there is no sensation of fullness or uneasiness in the bladder, nor any desire to urinate. The excrementitious elements of the renal secretion are more or less thrown off by the other emunc-

tories, but not sufficiently to prevent great constitutional suffering, evinced by general torpitude, apopleptic symptoms, etc. Most of the subjects of this complaint are fat, corpulent persons, considerably advanced in life, and the disease generally proves fatal in a very few days.

Treatment.—To relieve the blood as fast as possible of its urinous accumulations, the wet-sheet pack and dripping-sheet should be employed; while the action of the kidneys should be excited by the alternate hot and cold hip and foot-baths, or better still, perhaps, the warm douche followed by the cold to the loins and abdomen. The bowels should also be moved by copious injections.

Retention of Urine.—In this disease the urine is duly secreted, but its flow is interrupted by spasm, inflammation, calculi, tumor, stricture, abscess, concretions in the rectum, distention of the vagina, or debility or palsy of the bladder itself. A frequent cause is over-distention of the bladder in consequence of holding the water too long, when it has been inconvenient to void it. This condition is always attended with pain, protuberance, and a frequent desire to urinate.

Treatment.—In most cases a hot hip-bath, or hot fomentations to the abdomen, followed by a dash of cold water, will relieve; but if they fail, the catheter must be promptly employed.

Painful Urination.—*Strangury*, or a painful and dribbling discharge of urine, may result from several of the causes of the preceding malady; but generally it is excited by acrid food, drinks, or medicines, particularly cantharides, or Spanish flies, and is attended with a scalding sensation. It is also occasioned by a stricture, or callous thickening of the lining membrane of the urethra, in which case the micturition is extremely troublesome and distressing, the straining often causing the bowels to deject their contents at the same time.

Treatment.—These cases are generally relieved by copious water-drinking, and warm hip-baths; in severe cases the full warm-bath may be necessary.

Saccharine Urine.—*Diabetis*, termed *water-flux*, or *urinal dropsy*, by the authors, consists in a free or profuse discharge of urine, of a violet smell, and generally of a sweet taste, attended with great thirst and general debility. Medical writings are full of speculations as to the nature and proximate cause of the saccharine matter or sugar which is sometimes found in very large quantities in the urine of diabetic patients; but as they shed no light on the subject, they are hardly worth

our attention and limited space. The most important *fact* they have made us acquainted with is, that the skin is *always* in a condition of extreme torpitude.

Treatment.—This disease has terminated fatally, with very few exceptions, under allopathic treatment. Instead of dosing the kidneys or stomach, as has been and yet is the custom of the drug-doctors, we should direct our main efforts to restore the cutaneous function, which is, in fact, the only way to take off the excessive determination to, and irritation of, the kidneys. When the skin is cold, pale, and bloodless, the tepid dripping-sheet, followed by the dry pack so as to produce moderate perspiration, and the half or shallow-bath, followed by the dry rubbing-sheet, with thorough friction to the whole surface, are the leading measures of treatment. Water may always be drank to the extent of thirst, and the diet should be mainly farinaceous, and the articles principally dry or solid, as wheat-meal biscuits, brown bread, roasted potatoes, Graham crackers, etc.

Incontinence of Urine.—*Eneuresis*, as the present form of morbid urination is generally called, is a frequent or perpetual discharge, with difficulty of retaining the urine. It is variously occasioned by an acrid quality of the urine, local irritation, atony or debility of the sphincter of the bladder, and a superabundant secretion. The remote causes are chiefly hot drinks, diuretic drinks or medicines, intoxicating liquors, etc. The plan of cure is the same as for the preceding disease, especial care being taken to avoid, correct, or remove the exciting causes.

Unassimilated Urine.—In this affection the urine is impregnated or colored with various alimentary or medicinal articles which have been taken into and have found their way to the kidneys, and through the bladder, unchanged. Rhubarb, prussiate of potash, and other drugs pass rapidly to the kidneys without undergoing decomposition; and those articles which are called diuretics are carried to the kidneys directly without going the rounds of the circulation. In some cases of impaired digestion, the urine is impregnated with a matter resembling chyle. This affection is but an "effort of nature" to rid the body of extraneous ingredients; and hence copious water-drinking, a strict diet, and a daily bath are all the remedial measures which seem to be indicated.

Erratic Urine.—A vicarious discharge of urine at some foreign outlet is not an unfrequent occurrence. It is an evidence of the *vis med-*

icatrix naturæ, to deterge the blood of its urinous elements when some obstacle prevents their expulsion at the natural emunctory, or when from atony or disease of the kidneys it is not secreted at all. In such cases a urinous fluid has been evacuated by the stomach, bowels, skin, salivary glands, ears, eyes, nostrils, breasts, nave , and at ulcerous surfaces and fistulous openings. The medication is the same as in the preceding diseases.

Urinary Calculus.—Accumulations of calculous matter in the urinary cavities, are either *renal* or *vesical*, as they are found in the *kidneys* or *bladder*. Renal calculi comprehend the various forms of urinary *sand* or *gravel;* and vesical calculi constitute the various kinds of *stone*.

The chemical elements of these concretions are urea, uric acid, lactic acid, sulphates, hydrochlorates, and phosphates of potash, soda, and ammonia, and various other occasional ingredients. The most common form of urinary calculus is that called the *lithic* or *uric acid*, consisting of urea with some free acid and ammonia.

The *oxalate of lime*, called also *mulberry calculus*, is the next in frequency; and the other most frequent varieties are the phosphate of lime and ammonia, and phosphate of magnesia calculi. They vary in size from fine particles of sand to lumps of several ounces.

Symptoms.—Calculous matter in the kidneys is attended with a fixed pain in the loins, shooting downward toward the thighs, which are affected with numbness; the pain is increased by exercise; the urine often deposits a sandy sediment, which may be either of a white or red color; the pain often alternates with a sense of weight.

The passage of a large gravel or sandy particle through the ureters is often intensely agonizing, and accompanied with nausea, fainting, and generally retraction and inflammation of one of the testes. The pulse, however, is not affected, from which circumstance this affection may be distinguished from inflammation of the kidneys or bladder.

If the calculus is stopped in the ureter, heat, thirst, and fever come on, and the retained urine being thrown back into the blood, soon occasions intermitting pulse, coma, convulsions, and death.

Stone in the bladder produces a frequent desire of making water, with a difficulty of discharging it; there is acute pain at the extremity of the urethra, and on sounding the bladder the instrument meets with a sonorous resistance. After horseback-riding, or any hard, jolting exercise, the urine is bloody; in some cases it is voided by drops, and sometimes the stream is suddenly stopped before urination is completed. When the stone becomes large there is a dull pain about the

neck of the bladder, and the rectum is affected with a troublesome te nesmus.

Special Causes.—Hard water, the free use of salt, alkalies, especially the ordinary employment of saleratus; strong acids, as vinegar, vinous and fermented liquors, and flesh-meats, are the most common and most efficient causes.

The general connection of the calculous or *lithic acid* diathesis with the *gouty*—both being almost always manifested in the same person—points with unerring certainty to animal food and wine as among the leading causes.

There is no doubt in my mind that the salts and magnesia with which nursing mothers and sucking infants are so frequently dosed "for medicinal purposes," occasion many of the cases of gravel and stone we meet with in young children.

Treatment.—To alleviate the suffering, the warm hip-bath, and in extreme cases the full warm or hot-bath is necessary; and if the pain is prolonged, the wet-sheet pack, of two or three thicknesses, will be the best sedative.

The curative treatment consists in freeing the whole system from all extraneous ingredients as rapidly as possible, for which purpose the diet must be strictly vegetable; the drink nothing but pure soft water, and frequent packing and rubbing wet-sheets, with such additional appliances as the general health may demand.

Our old-school friends have a variety of chemical tests to determine the *acid* or *alkaline* predominance of the calculus; if acidity prevails, alkalies are administered; and if alkalies are most abundant, acids are the remedies. This is like putting out a fire by throwing on green or wet wood; it dampens the flame for a moment, but increases the combustion in the end. These acids and alkalies are all the while filling the system with the very ingredients which afford the material for calculous formations. The surgical operation for stone will be considered hereafter.

Note.—The success which has attended the *diuretic* treatment of calculous affections, in the hands of some physicians who have made this branch of the profession an exclusive business, is corroborative of the pathological and therapeutical views above advanced. The treatment of these "gravel doctors" consists mainly in the free use of *vegetable* diuretic drinks—decoctions of dandelion, milk-weed, queen of the meadow, etc These drinks are continued for several months, and by increasing the amount of fluid which passes through the kidneys and bladder, assist to wash away the superfluous earthy particles.

CHAPTER XX.

DISEASES OF THE SKIN.

Some *three hundred* abnormal appearances of the skin have been described as distinct diseases by authors; and I know not why a sufficient amount of ingenious but useless analytical skill, by elevating every peculiar mark, spot, blotch, patch, or pimple, to the rank of a specific malady, might not extend the list to three thousand. The following tabular arrangement comprehends all that are important to distinguish, for either theoretical or practical purposes:

Cutaneous Rashes	Rose Rash, Gum Rash, Lichenous Rash, Pruriginous Rash, Millet Rash.	Scaly Eruptions	Dandruff, Leprosy, Psoriasis, Ichthyiasis
Blains	Water-Blebs, Herpes, Rhypia, Eczema.	Humid Scalls	Impetigo, Porrigo, Ecthyma, Scabies.
Macular Skin	Veal Skin, Mole, Freckles, Sunburn, Orange Skin, Piebald Skin, Albino Skin, Cyanosis.	Morbid Sweat	Profuse, Bloody, Colored, Scented, Sandy.
Cutaneous Vermination	Lousiness, Insect Bites, Worms.	Morbid Hair	Bristled, Matted, Extraneous Forky, Gray, Baldness, Areated, Discolored, Sensitive.

Cutaneous Rashes.—*Rose Rash—roseola* of authors—is an efflorescence which appears in blushing patches on the cheeks, neck or

arms, often fading and reviving; usually appearing in the spring or autumn. *Gum Rash—strophulous*—is peculiar to early infancy, and consists in an eruption of red or whitish pimples about the face, neck, and arms, interrupted by irregular patches of inflammatory blush, and manifesting several sub-varieties, called *red gum*, *white gum*, *tooth rash*, *wild-fire rash*, etc. The *lichenous rash* is characterized by a diffuse eruption of red pimples, with a troublesome and sometimes intolerable sense of itching or pricking; it is subdivided into *simple lichen*, *summer rash*, or *prickly heat*, *wild lichen*, *nettle lichen*, *hair lichen*, *clustering lichen*, *livid lichen*, according to its varying and unimportant appearances. *Pruriginous rash* is known by a diffuse eruption, with pimples of nearly the same color as the cuticle, itching acutely, and when abraded or broken by the nails, emitting a fluid that concretes into minute black scabs. The *millet rash* is distinguished by very minute, tubercular, distinct, milk-white, hard, and glabrous pimples, which are confined to the face.

Special Causes.—Roseola is often symptomatic of other diseases. When idiopathic, it is produced by sudden and extreme alternations of temperature, drinking very cold water after violent exercise, etc. Gum rash is produced by coarse woolen clothing, uncleanliness, greasy and highly-salted food, and various other bad dietetic habits of either mother or child. Lichenous rash is more frequently attributable to morbid bile than to any other single cause; and when a torpid liver is connected with an obstructed skin, and both of these conditions with a high summer temperature, we have the causes of its worst forms. Dr. Good remarks: "So far as I have seen, the varieties of this disease depend upon a *peculiar irritability* of the skin as its remote, and some *accidental stimulus*, as its exciting cause." If there is any thing but "superfluous nonsense" in such a flourish of words, I am no judge of the article. Pruriginous rash is more especially attributable to retained perspirable matters, and these have their cause in cutaneous uncleanliness. Some authors have imputed this form of skin disease to a fish diet. Millet rash, Dr. Good imputes to "a torpid state of the cutaneous excretories, or rather of their mouths or extremities, which are obstructed by hardened mucus." This is a roundabout but very delicate way of representing the idea of a dirty skin.

Treatment.—I have many times in the course of this work had occasion to characterize the popular practice in relation to certain diseases as barbarous, unphilosophical, absurd, pernicious, etc. I have used these terms deliberately, conscientiously, and, in my own estimation at least, understandingly. But if I were to express an honest opinion of the ordinary drug-medication in the whole range of skin dis-

eases, I should apply to it all the preceding epithets, and add to them the little word *silly*. The ridiculous was never at a remoter distance from the sublime, than is the prevailing drug-treatment in affections of the skin, from true science.

The common, every-day remedies in the majority of skin diseases, are mercury in its most potent forms of corrosive sublimate and red precipitate, arsenic, antimony, iodine, preparations of lead, copper, zinc, and other minerals, with a formidable list of irritating and narcotic ointments, all of which tend to *repel the disease to the internal parts*, besides poisoning the system with the drug-remedy. Many an adult has been indebted for a fatal disease, and many a child for a ruined constitution, to the medication of a skin disease. For a single illustration—and thousands like it might be quoted from standard medical books—Dr. Good, who ascribes millet rash to an obstructed skin, instead of telling us how to clear out the obstruction, prescribes "lotions of brandy, spirit of wine, tincture of myrrh, a solution of sulphate of zinc with a little brandy added to it."

The hydropathic management is intended to answer two indications; 1. To allay the local irritation; 2. To purify the blood and all the secretions. In almost all cases of excessive irritation of the skin, unaccompanied with fever, tepid water is preferable to very cold for bathing purposes. The pack, followed by the half-bath at about 72°, with moderate rubbing or friction, is one of the best leading processes. The half-bath alone, if accompanied with a rigidly plain and abstemious diet, will generally very soon effect a cure; and the same may be said of the dripping-sheet; in fact almost any kind of washing, if sufficiently frequent, with a plain diet, will cure in due time. There are no diseases in which stale meats, highly-salted or highly seasoned foods, greasy mixtures, and excessive alimentiveness, have a more pernicious influence than in the affections under consideration. It is also of some importance to preserve a uniform temperature of body, avoiding all extremes of heat or cold, and especially damp, chilly winds. When the itching or pricking is unendurable, the full warm-bath may be advantageously employed as an occasional sedative.

Scaly Eruptions.—The first variety, *dandruff*, consists in patches of fine branny scales, easily separated from the cuticle, which is not irritable or tender. It may affect the head, trunk, or whole body; in the latter case the scaliness is red, brown, or yellow.

Leprosy—lepra—lepriasis—presents patches of smooth laminated scales, of a circular form, and of different sizes, surrounded by a reddish prominent circle, with a central depression, scattered generally

over the surface. Its principal sub-varieties are the *common* or *white leprosy*, and the *black leprosy;* so called from the color of the scales, which varies from a bright white to a dusky brown. In some cases the scales exist in scattered patches and in others in confluent clusters. It has generally been regarded as contagious, although some authors dispute its contagiousness altogether.

Psoriasis—dry scall—rough scabies—consists in bright patches of continuous scales, of indeterminate outline, generally appearing in serpentine or tortuous stripes and found chiefly on the back and face, but sometimes extending over the whole body. In children it is considered contagious. The surface is often chapped and excoriated, and itches or burns whenever exposed to unusual heat. A sub-variety of this affection has been called *grocer's itch*, *baker's itch*, etc. It frequently affects the hands of grocers, bakers, bricklayers, washerwomen, and bleachers, especially in the spring and fall.

Ichthyiasis—fish skin—is a harsh, papulated, watery rind, or horny incrustation, of a dusky, brown, or yellow color, sometimes covering the whole body, except the head and face, palms of the hand, and soles of the feet; and sometimes the entire body, including the face and tongue. In some cases horn-like excrescences sprout out of the incrustations, and occasionally grow to the extent of several inches. It is regarded by authors as a morbid development of the cuticle, and is generally congenital.

Special Causes.—Gross food, personal uncleanliness, and sudden alternations of temperature, are the ordinary causes. Dandruff in the head is often produced by too much head apparel, greasing or oiling the hair, confining it too closely on the head, and excessive brain labor. That leprosy was regarded as emphatically a disease of bodily impurity, when it prevailed among the ancient Hebrews, is evident from the whole tenor of the code of the Jewish law-giver on the subject of personal cleanliness, especially as related to the food of his people, and the rigid measures of purification deemed necessary in the treatment of lepers under the Mosaic dispensation.

Treatment.—The principal point of difference in the management of cutaneous rashes and scaly eruptions is this: in the latter, on account of the less degree of irritability or tenderness of the skin, water of a colder temperature may be employed, and considerable friction can generally follow the bath with advantage. Probably the most efficacious treatment in a majority of cases, would be the long pack, from one to two hours—using two or three thicknesses of the wet-sheet, followed by a thorough rubbing with the dripping-sheet. Of course, when there is no preternatural or feverish heat, due precautions must be taken to

secure proper reaction or a comfortable glow after each pack. Dandruff of the body can always be cured by a persevering employment of the wet towel; and when the head is badly affected, so that the hair is loose and easily falls out when the comb is used, the hair should be worn rather short, and the head bathed once or twice a day in very cold water.

Blains.—These affections consist in roundish elevations of the cuticle, containing a watery fluid.

In *water-blebs—pompholyx*—the eruptions, which are mostly distinct, and break and heal without scale or crust, contain a reddish transparent fluid. They appear successively in various parts of the body, of the sizes of peas, filberts, or walnuts, sometimes bursting and healing in three or four days, but occasionally forming an ulcerated surface.

Tetter—herpes—is an eruption of vesicles in small distinct clusters, with a red margin; transparent at first, but soon becoming opaque; it is attended with tingling or itching, and the vesicles concrete into scabs, and desquamate in the course of two or three weeks. It presents several sub-varieties, as *miliary*, when the vesicles are millet-sized; *corrosive*, when the vesicles are hard and discharge an acrid, corroding fluid, which spreads in serpentine trails; *shingles*, when the vesicles are pearl-sized, and spread in clusters around the body like a girdle; *ringworm*, when the vesicles have a reddish base, and are united in rings; *rainbow-worm*, when the vesicles, which unite in small rings, are surrounded by larger concentric rings of different hues, and *local*, when they are limited to a particular part.

In *rhypia—rhupia—sordid blain*—the eruption consists in broad, distinct vesicles, having a slightly inflamed base, and filled with a sanious fluid, which often produces gangrenous and offensive eschars. The scabs are thin and superficial, and easily rubbed off and reproduced.

Eczema—heat eruption—consists in minute, distinct, but closely crowding vesicles, containing a transparent or milky fluid, attended with troublesome itching or tingling, and terminating in thin scales or scabs.

Special Causes.—Rayer, who has written an elaborate treatise on diseases of the skin, assigns "chronic vascular inflammation or irritation," as the nature, cause, sum and substance of nearly the whole catalogue, while Drs. Good, Cooper, and Thompson, equally eminent authors, dispose of this branch of the subject quite as conveniently by the phrase, "a peculiar irritability with debility, either general or local"—phrases which I am sorry to say I cannot divine the meaning

of. Indigestible food and intoxicating liquors are the ordinary causes of water-blebs. Tetter is generally owing to acrid bile, thrown upon the surface. Rhypia almost always affects children who have been reduced by bad nursing and bad drugging. Heat eruption is usually produced by violent exercise, exposure to hot air, or the direct rays of the sun, and not unfrequently by the use or abuse of mercury.

Treatment.—In addition to the general plan of treatment recommended thus far for skin diseases, the digestive function, being more particularly implicated in the diseases before us, requires some special additional attention. In all the varieties of tetter or herpes, free water-drinking, frequent hip-baths, and the abdominal girdle are appropriate. In the sordid blain of children, the parts affected should be frequently washed in very cold water, except when the abraded surface is itchy and tender, when warm or tepid washing is the most soothing.

Humid Scalls.—The present genus of scall or scale-skin diseases is characterized by an eruption of small pustules, either distinct or confluent, which harden into crustular plates.

Impetigo—running scall—appears in yellow, itching, clustering pustules, terminating in a yellow scaly crust, intersected with cracks. It is generally confined to the hands and fingers, but sometimes extends over the lower extremities, and occasionally affects the neck and face. A thin ichor or purulent matter often issues from the numerous cracks, which corrode the skin and cellular membrane; and in some cases the aggregated scabs form a thick, rigid casing around the affected limb so as to impede its motion. Sometimes the disease commences with a puffy swelling of the face, with œdema of the eyelids, very much resembling erysipelas, but without its smooth polish.

Porrigo—scabby scall—tinea—consists of straw-colored pustules, which concrete into yellow scales. Its principal sub-varieties are, the *milky scall*, or *crusta lactea*, which chiefly affects infants at the breast, the pustules commencing on the cheeks and forehead, and often covering the whole face with a continuous incrustation; and the *scalled head—tinea capitis*—found mostly in young children, marked by pustules which commence in the scalp in distinct patches, and gradually spread until the whole head is covered, and the roots of the hair destroyed. It is generally regarded as contagious. Other less important forms have been called *lupine, honeycomb, furfuraceous, ringworm*, etc.

Ecthyma—papulous scall—is characterized by large, distinct pustules, raised on a hard red base, and terminating in hard, greenish, or dark-colored scabs. It occurs at all periods of life, from the earliest infancy to advanced age, and is very often symptomatic of other diseases.

Scabies—itch—is an eruption of minute pimples of a papular, pustular, vesicular, or mixed character, accompanied with intolerable itching; it is found chiefly in the flexures of the joints or between the fingers, and is highly contagious. It is one of the most complicated of the cutaneous diseases, presenting many sub-varieties, the principal of which are the *papular* or *rank itch*, the *vesicular* or *watery itch*, the *purulent* or *pocky itch*, the *complicated*, in which the disease extends over the body, often affecting the face, and the *mangy itch*, which is produced by handling mangy animals.

Special Causes.—Most of the forms of humid scalls are owing to the combined operation of two sets of causes, one of which is negative and the other positive. The negative causes are the absence of water, soap, flesh-brushes, and coarse towels, the positive, are gross and irritating food, as fried pork, salt ham, sausages, old cheese, fried cakes, and cooked and burnt fats of all kinds, and acrid or stimulating drinks, as hard cider, acid wines, and ardent spirits. Some forms of humid scall, which are confined to the hands and feet, are occasionally produced by severe exposures to cold or wet; a remark which holds true also of some forms of dry scall which are confined to the extremities. Mothers ought to know that *their* dietetic habits may induce these and many other cutaneous diseases in their offspring while nursing, and even before birth.

Treatment.—Thorough and frequent ablutions, with a plain vegetable diet, and the constant use of wet compresses when the skin is abraded or ulcerated, comprise the general remedial course. The patient should be kept in a moderate uniform temperature, and when the hands or feet are deeply cracked, sore, and exposure is inevitable, the sores should be anointed occasionally with olive oil or sweet cream, taking the precaution to wash or soak the part in warm water before applying it. Parents, as they value the future health of a child, should avoid all repellant lotions, ointments, or all-healing specifics, in all forms of skin diseases. They may indeed smooth the skin, but the disease will be only transferred to an internal and more vital part.

The whole system of allopathic medication is calculated to *drive the disease in;* but all rational practice will contemplate the exact contrary. On so simple a disease as the common itch, which is always cured as soon as the skin can be made clean, nearly the whole force of the apothecary shop has been spent in vain; and the disease has been cured by two or three thorough *soap-sudsings*, after sulphur, lead, mercury, arsenic, tar, turpentine, human and animal urine, chalybeate waters, gunpowder and whiskey, gin and salts, and white and red precipitate ointments had been used without success.

CUTANEOUS VERMINATION.—The cuticle may be infested with the *common louse*, which mostly inhabits the heads of uncleanly children; the *crab louse*, which is found chiefly about the groins, pubes, and eyebrows of unhealthy persons, producing extreme itching; the *common flea*, whose eggs are deposited on the roots of the hair and on flannel; the *chiggre*, a West Indian flea, not more than one fourth the size of the common flea, which deposits a bunch of minute eggs in the feet of dirty persons, sometimes occasioning ulceration and mortification; the *tick*, of which there are several varieties—the *domestic tic*, *itch tick*, and *harvest bug*—whose bite occasions an itching and smarting pain; the *Guinea-worm* of the Indies, the *gad fly*, which is common to quadrupeds, but sometimes burrows in the mucous membrane of human noses; and the *hair worm*, which, by the way, involves a disputed point, whether the infestment is a *live animal*, or merely a morbid growth of *real hair*.

Personal cleanliness is the best preventive of these intrusive creatures, and cold compresses are the best remedies when bitten by any of them. The second variety, crab louse, is often excessively troublesome. Medical books tell us that strong mercurial ointment is sure death to them; and the same may be said of strong soap-suds, or a sufficient amount of cold bathing and friction without the soap.

MACULAR SKIN.—Simple discolorations of the surface are generally the result of depraved secretions, retained excretions, the introduction of drugs or foreign substances in the body, blows or bruises, or of exposure to strong cold winds or hot sunlight. Sometimes, however, a change in the color of a part or of the whole skin takes place, which we are unable to trace to either of these causes; and one example—cyanosis—is frequently owing to organic malformation of the heart.

In the *veal skin* variety the skin is marked by white, shining, permanent spots, the superincumbent hairs falling off and never reappearing. The *mole* is a permanent, circular, brown patch, sometimes slightly elevated, and crested with a tuft of hair. *Freckles* are yellowish-brown dots on the cuticle, resembling minute lentil seeds, and often transitory. *Sunburn* is a tawny discoloration from exposure to the sun, which disappears in the winter; *orange skin* is mostly confined to young infants whose mothers were affected with torpidity of the liver during gestation, but it sometimes appears in adult life from biliary obstruction. *Piebald skin* is a general marbled appearance of the cuticle, with alternate patches of black and white. *Albino skin* is a dull-white state of the cuticle, with rosy pupils, weak sight, and white or flaxen hair; it is usually found among negroes, but is sometimes known

among the white races; it is sometimes congenital, and in some instances the adult black and also white, have changed to Albinoes.

Cyanosis—blue disease—cyania—is known by the whole skin being more or less blue, the lips purple, with general dullness of mind and debility of body; it is always congenital.

Special Causes.—Severe fevers have been followed by various permanent discolorations; even a black man has been transformed into a white man by this cause. In some cases, spotted and motley-colored skins are hereditary. Mineral medicines often produce livid spots or a universal dingy, bluish, or dark appearance of the skin. Nitrate of silver is a very common cause. When administered for several weeks, it frequently produces a deep tawny and uniform discoloration, approaching to a black, being deepest in the parts most exposed to the light. Sometimes, however, discoloration from this drug appears in patches, and sometimes one half of the body is affected.

The blue disease is generally owing to some malconformation of the heart, the most common of which is a communication between the two ventricles, thus rendering the decarbonization of the blood imperfect, and giving rise to the venous or carbonaceous discoloration. Nitrate of silver has also produced a bluish tinge of the whole skin, closely resembling cyanosis.

Treatment.—Most of these affections are unimportant trifles, and many of them are unalterable for the better. Yellow skins, blotches, motley appearances, etc., when induced by a diseased liver, can be often cured by restoring the functional action of this organ. When the skin is discolored by drugs, a persevering employment of the wet-sheet, with a course of free water-drinking and plain vegetable diet, will do all that can be done in the way of medication, although it will seldom wholly remove the difficulty. The blue disease is incurable, its subjects are feeble and short-lived; and all that can be done to prolong existence is found in plain, quiet, simple habits of life.

Morbid Sweat.—*Profuse perspiration*, when not a symptom of some acute disease, is an evidence of debility, and requires no attention, save a course of tonic bathing and regimen. *Bloody sweat*, though regarded as an idiopathic disease by some authors, is usually a vicarious affection, as in mis-menstruation, or the result of vehement emotion, violent exertion, or intense agony. *Partial sweats* are, I believe, always symptomatic. *Colored sweats*, which may be green, blue, black, or yellow, result from obstruction of the liver or kidneys, or from some metallic or mephitic impregnation. *Scented sweat* may be rank or fetid, sour or acrid, sulphurous or musky, saline, aromatic, etc. Most

of these varieties depend on the dietetic habits of the individual, in connection with the amount of bathing practiced. Some persons, who never or but seldom bathe, and eat strong food, are exceedingly disagreeable to the olfactory nerves of others. Many persons who exercise much on foot, wear flannel stockings, and bathe rarely, have a horribly offensive scent, which becomes intolerable on exposing the feet to the fire. I once had a patient who exhaled from the axillæ a strong musky, or rather blue-dye odor, for which he could assign no probable cause. *Sandy sweat*, known by a reddish sandy material concreting on the surface, indicates great deficiency in the functional action of the kidneys, or great excess in the saline and earthy matter taken into the system with the ingesta. The proper treatment, I trust, is sufficiently obvious in all these cases without further remark.

Morbid Hair—Trichiasis.—Even the hairs of our heads may become deranged by our physiological transgressions, although, next to the bones, they are the most indestructible of our bodily constituents. The *bristly* or *porcupine hair*, is usually regarded as an effect of gross nutriment connected with general habits more congenial with *perfect animal* than *progressive human* nature. *Matted hair—plica polonica*—the hairs becoming vascularly thickened, inextricably entangled, and matted together by a glutinous secretion—is supposed to result from covering the head too closely, as with a thick woolen bonnet or leather cap, with little or no attention to combing, washing, or in any way cleansing the head. *Extraneous hair—trichosis*—is most commonly noticed in bearded women, and has been imputed to excessive menstruation, the excessive use of pork, shell-fish, and other gross foods. *Forky hair*—the hairs of the scalp weak, slender, and splitting at their extremities—is a common complaint, depending for its immediate cause on defective nutrition in the bulb or root. *Gray hair*, when not "frosted by age," may be produced by fright, terror, grief, excessive brain labor, violent fevers, etc. *Baldness* may result from the same causes as gray hairs, and is often the consequence of skin diseases. It is far more common in males than in females—which fact seems to corroborate the physiological notion which some have advanced, that the common practice of cutting the hair and shaving the beard is a source of bodily infirmity. *Aerated hair*—patches of bald spots in the scalp or beard—is probably owing to some obscure skin disease or preternatural excitement of some portion of the brain. *Miscolored hair*—the hair changing to blue, black, green, or spotted—occasionally results from fevers, terror, heating the head, mineral and metallic vapors, etc. *Sensitive hair* is usually owing to cerebral excitement: and

this is usually owing to wounds or injuries of the head, and febrile or inflammatory affections. The hair, in some instances, is so acutely sensitive that the slightest touch, or the cutting of a single hair, gives exquisite pain.

Treatment.—Cutting the hair short, and frequently bathing the whole head in cold water, is the general restorative process in these deviations from health—some of which, however, are not curable. In cases of excessive sensibility or tenderness, tepid or moderately warm water should be employed. In the plica polonica, the hair should be cut very close, the scalp frequently washed with tepid water, and derivative hip and foot-baths directed. And in all cases the general regimen must be physiologically regulated, and such bathing appliances brought in requisition as the general health and particular circumstances indicate.

CHAPTER XXI.

POISONS.

So general is the employment of substances for chemical, mechanical, and *medicinal* purposes, which are poisonous to the living organism, whether taken into the stomach or applied to the skin; and so numerous are the emergencies wherein relief must be either immediate or impossible, that a work of this kind would be sadly defective without a brief consideration of this branch of pathology and therapeutics.

Toxicologists have usually classified poisons according to the kingdoms from whence they are derived, as *mineral*, *vegetable*, and *animal*. Some have arranged them according to their *action* on the animal economy, and others have merely distinguished them into *general* and *local*. Christison, who has written the most elaborate work on this subject, divides them into *irritants*, *narcotics*, and *narcotic-acrids*. The first embraces all poisons whose principal symptoms are those of irritation or inflammation; the second produce stupor, delirium, spasms, paralysis, etc.; and the third, as the term implies, produce either or both sets of symptoms, according to the dose and other circumstances.

But what are poisons? This is a problem not yet settled among medical men. In its broadest sense, the term must comprehend every thing foreign to the natural constituents of the human body, and even these constituents themselves, when *their* constituent elements are in

unnatural relations or proportions; every thing, in a word, which is not properly food, drink, or atmosphere. This latitude of definition will include the whole materia medica of our allopathic friends; and in truth, almost every poison known is an integral part of that materia medica. Established usage has, however, restricted the idea of *poison* to the sudden, prominent, and immediately-dangerous effects of these articles, while their equally morbid yet more slow, gradual, and remote consequences are called *diseases*.

Were I to attempt—what no toxicologist has yet accomplished—a *satisfactory* and philosophical arrangement of poisons, I should base it on the allopathic materia medica, as *tonic* poisons, *stimulant* poisons, *emetic*, *cathartic*, *diaphoretic*, *expectorant*, *vermifuge*, and *escharotic* poisons, etc.; but whether such a classification would be *pathological* or *therapeutical*, is a question I am willing to submit to "future generations." In the present chapter, the effects of *large* or *poisonous* doses will be chiefly considered, and *small* or *medicinal* doses only incidentally alluded to.

Acids.—The *nitric*, *sulphuric*, *muriatic*, or *hydrochloric*, *phophoric*, *oxalic*, and *acetic* acids, are corrosive poisons; and whether taken internally or applied externally, produce redness, inflammation, vesication, and ulceration.

Symptoms.—When swallowed, a burning sensation in the throat, excruciating pain in the stomach, and gaseous eructations are usually the immediate effects. When taken in extremely large doses, the sensibility may be so suddenly destroyed that the pain will be deceitfully slight. All the symptoms are most severe when the poison acts upon an empty stomach.

Treatment.—All alkalescent matters are chemically antidotes; there is, however, a choice, for the reason that some alkalies are themselves extremely corrosive. Chalk and magnesia are the best. A solution of nard soap answers very well. Slaked lime, or carbonate or supercarbonate of soda may be given; and in the absence of all these, a remedy may be found in the common plaster of an ordinary room, which may be beat down in a moment and made into a thin paste with water. The patient should drink as much water as he can swallow conveniently. The stomach-pump is not necessary.

Alkalies.—*Caustic potash*, *saleratus*, *quick-lime*, *salt of tartar*, *pearlash*, *soda*, *sal ammoniac*, *carbonate of ammonia*, or *smelling salts*, and *spirits of ammonia*, or *hartshorn*, are the usual alkalies from which accidental poisoning results.

Symptoms.—These do not differ essentially from those produced by the strong acids.

Treatment.—Of course, all acids are antidotal. Vinegar, lemon-juice, or any of the stronger acids, largely diluted, may be given. In the absence of acids, any of the fixed oils, as olive or almond, by converting the alkali into a soap, will neutralize its corrosive effects. In other respects, the treatment is the same as for acid poisons. The resulting inflammation, *in all cases* of poisoning, is to be treated precisely like inflammation from other causes.

Neutral Salts.—The most virulent of the preparations commonly known as neutral salts is *nitrate of potash—saltpetre, nitre, sal-prunelle.* In the apothecary-shops mistakes are often made, by which this article is put up for sulphate of soda, sulphate of potash, and other saline laxatives, so that the patient gets poisoned. It produces stinging pains in the stomach, and the usual symptoms of a violent cholera, with coldness, debility, and great exhaustion of the nervous system. Other neutral salts in common use, as Glauber and Epsom, are not dangerous except in excessive doses; the symptoms then are drastic purging and great debility.

Treatment.—We have no direct antidotes in the cases before us, and our duty is chiefly to combat inflammation. When nitre has been swallowed, warm water must be freely taken, and the stomach-pump employed if practicable. Wet bandages to the whole abdomen are called for, and the warm-pack is often serviceable. The effects of the other neutral salts are to be counteracted by cool or cold injections, and warm hip-baths.

Mercury—Hydrargyrum.—The most actively-poisonous of the salts and oxides of mercury in common use, are *calomel, turpeth mineral, corrosive sublimate, red precipitate, cinnabar, vermillion,* and *cyanuret.* Of these, red precipitate and vermillion are most frequently the agents of accidental poisoning; while calomel and corrosive sublimate are the common agents in medicinal and suicidal poisonings. It is a serious fact, among the "curiosities of medical literature," that the standard books recognize *fifty-one distinct diseases* resulting from the *medicinal* administration of the various preparations of mercury!

Symptoms.—When very large doses are taken, especially of the more powerful of the mercurials, there is violent pain in the stomach, intense thirst, vomiting, heat and fever. When corrosive sublimate has been given in large doses, or when small doses have been a long time

continued, there is a griping pain in the bowels, with a tendency to diarrhœa. When the system is slowly and gradually saturated with the poison, the effects are distinguished by the general term *salivation*, the symptoms of which are general fever, tremors, fœted breath, brassy taste, sore gums, loosened teeth, driveling at the mouth, swelled tongue, and often ulcerated bones. In some cases the tongue is enormously swollen, and protrudes hideously from the mouth, the poor poisoned patient being unable to articulate or swallow.

Treatment.—When a large dose of corrosive sublimate has been swallowed, albumen or gluten will decompose the salt and prove an effectual antidote. The albumen may be found in the white of eggs, and the gluten in wheaten flour. Either may be given freely; the white of eggs being previously beaten up with water or milk, and the flour may be administered in either water or milk. In the absence of either eggs or flour, milk is the next best antidote.

To cure salivation, and remove mercury and its effects from the system, require a persevering employment of the packing-sheet, which may be warm, tepid, or cold, according to the susceptibility of the patient, and so managed as to produce moderate but frequent perspiration.

When paints, ointments, etc., which contain some form of mercury, are accidentally swallowed, the patient should drink copiously of warm milk made into a very thin batter with wheaten flour, and, if the accident is soon discovered, the stomach-pump should be employed.

ARSENIC—ARSENICUM.—The arsenical preparations from which poisoning occasionally results are, the *protoxide*, or *fly-powder*; *arsenious acid* or *white arsenic*, commonly called *ratsbane*; *arsenite of copper* or *mineral green*; *arsenite of potass*, as in *Fowler's solution*; *arseniusetted-hydrogen gas*, which is evolved in various chemical operations; and several *sulphurets* of arsenic, as *realgar*, *orpiment*, and *king's yellow*.

Symptoms.—In a great majority of cases there is violent irritation and inflammation of the whole alimentary canal; a burning pain in the throat and stomach, which soon extends over the whole abdomen, with nausea, faintness, and extreme prostration of strength. In some cases, however, the pain is slight, the nausea and vomiting moderate, but the vital depression excessive and alarming, and often attended with convulsions, paralysis, insensibility or delirium. When arsenic has been given medicinally in small doses for some time, the first prominent symptom of its specific action on the system is a peculiar puffiness of the whole face, called in medical parlance *œdema arsenicalis*, and

attended with redness of the eyes, and followed by gripings, nausea, purgings, and a gradual sinking of the vital powers.

Treatment.—The stomach-pump should always be resorted to at once, if possible. If this is not at hand, the patient should drink copiously of warm water, and have the throat tickled with the finger or a feather to excite vomiting. We have no antidote, in the chemical sense, and medical books recommend a variety of diluent and demulcent liquids, to involve the poisonous matter and thus indirectly defend the coats of the stomach. Flour and water, and olive oil, are complete substitutes for the whole list. Some authors advise large quantities of the *hydrated sesquioxide of iron;* but its value is uncertain and far from being reliable.

To remove the subsequent inflammation and counteract the effects of the poison, Dr. Pereira tells us: "Our principal reliance must be on the usual antiphlogistic measures, particularly blood-letting, both general and local, and blisters to the abdomen. One drawback to the success of this treatment is the great depression of the vascular system, so that the patient *cannot support* large evacuations of blood"—the same as to say, the patient must be bled on theory, although it will kill him in practice.

ANTIMONY—ANTIMONIUM.—Accidental poisonings with antimonial preparations are uncommon; but medicinal poisonings are extremely frequent. Death very often results from an over-dose of tartar emetic; and this deadly drug is extensively diffused among us, being a common ingredient in candies, lozenges, cough mixtures, drops, and syrups, etc. The popular preparations of the regular pharmacopœias, *James' powder*, and *Plummers' pill*, are strongly charged with this dangerous drug. Besides *tartar emetic*, the *oxide* or *sesquioxide* of the metal, called *flowers of antimony*, and the *chloride*, are sometimes the agents of accidental poisoning.

Symptoms.—Small doses produce scarcely any obvious effect save general debility. Large doses produce epigastric pain, vomiting, and often purging. In very large doses it occasions extreme muscular relaxation, nausea, depression, vital exhaustion, sometimes convulsions and death. Applied to the skin, tartar emetic produces an eruption of painful pustules resembling small-pox. Death has resulted from the absorption of the drug, when it has been applied to an abraded surface.

Treatment.—Our main reliance must be on the warm water emetic, in the early stage, and the usual "antiphlogistic" water-treatment in the later stages. Persons who are severely poisoned with any form of antimony are always cold, torpid, sensitive, and debilitated, so that

our bathing appliances must be gentle and of moderate temperature. The warm-bath is excellent to check excessive evacuations when a large dose of the drug has been taken. Medical books recommend astringents, as tea, nutgall, cinchona, etc., on the supposition that tannic acid is antidotal to tartar emetic. But the numerous experiments which have been tried do not establish its claim to this title.

LEAD—PLUMBUM.—All the preparations of this metal, except the sulphurets, are energetic poisons. The *acetate—sugar of lead—saccharum saturni*, is the form in which it is usually given internally as a remedy. The preparations from which accidental poisonings chiefly result are, *litharge—the protoxide of lead; red lead—the red oxide*, or *deutoxide; white lead—carbonate of lead;* and *Goulard's extract*—the *diacetate*. Milk, molasses, and even pure water, may acquire a poisonous property by standing in leaden vessels. Red earthen-ware ought never to be used for cooking fruit or pastry, on account of its lead glazing; indeed all colored crockery ought to be "ruled out" on account of its metallic coloring matter.

Symptoms.—Small doses check the secretions generally, and constipate the bowels. Large doses constringe the circulating vessels, reduce the pulse, diminish the temperature of the body, produce dryness of the mouth and throat, and a general wasting of the body. In most cases of lead poisoning there is a narrow leaden-blue line bordering the edges of the gums, attached to the necks of two or more teeth of either jaw; the saliva is often bluish. The extreme effects are *lead-colic*. Excessive doses produce more or less gastro-enteritis.

Treatment.—The warm water emetic must be given in the first instance, and the stomach-pump employed if practicable. The soluble alkaline or earthy sulphates, or the alkaline carbonates, will lessen the injurious effects of the preparations of lead, by changing them to sulphates. For this purpose phosphate of soda, alum, Glauber or Epsom salts are appropriate. These chemicals are unnecessary when the vomiting has been thorough or the stomach-pump introduced. The treatment for lead-colic has already been given.

COPPER—CUPRUM.—The salts of copper have been much employed in the manufacture of culinary vessels, and to color candies, sweetmeats, and preserves, from which frequent poisonings have resulted. The preparations in common use are *mineral green*—the *hydrated oxide; blue vitriol*—the *sulphate; natural verdigris*—the *carbonate;* and *artificial verdigris*—the *mixed acetates*.

Symptoms.—These are quite various. In small doses they are

manifested by cramps, paralysis, discolorations of the skin, slow fever, wasting of the body, chronic inflammation of the stomach and lungs, etc. In large doses, nausea, vomiting, coppery taste, eructations, griping pains, and giddiness result. Very large doses produce convulsions and insensibility, with the usual symptoms of gastro-enteric inflammation.

Treatment.—Wheaten flour, milk, and the white of eggs, are here our antidotes again. Vinegar has been a popular prescription, but it is actually injurious.

Bismuth—Bismuthum.—There are two preparations of this metal in common use; the first is the *trisnitrate*, which is extensively used in medicine, and known by the various names of *oxide of bismuth*, *subnitrate of bismuth*, and *magistery of bismuth*; the second is the *tartrate* of the metal, and is extensively used in the cosmetic art under the name of *pearl white*. They are both caustic poisons.

Symptoms.—Small doses diminish the sensibility, but large ones cause pain, vomiting, giddiness, gastric disorder, cramps in the extremities, etc. The cosmetic preparation has produced spasmodic trembling of the muscles of the face, terminating in paralysis.

Treatment.—We have no chemical antidote, and must rely on warm water, the stomach-pump, etc.

Tin—Stannum.—The *chlorides* of tin, used in color-making and dyeing, and the *oxide*, which forms a part of the putty-powder for glass staining and silver plating, are the preparations of this metal which sometimes, though rarely, occasion poisoning. *Powdered tin* has been given in ounce doses to expel the tape-worm. The *symptoms* of tin poisoning are similar, and the *treatment* the same as in the case of the preparations of bismuth.

It ought to be known to housekeepers that acid, fatty, saline, and even albuminous substances, may occasion colic, vomiting, etc., after having remained for some time in tin vessels.

Silver—Argentum.—*Nitrate of silver—lunar caustic*—though a powerfully corrosive poison, is extensively prescribed internally as a *nervine*, *tonic*, and *astringent* medicine. The *chloride*, *oxide*, and *cyanide*, are other preparations of the metal occasionally misapplied to the human stomach.

Symptoms.—Applied to the skin, hair, or nails, nitrate of silver stains them black; to an ulcerous surface it produces a white film; and to a mucous membrane, smarting pain, and inflammation, which lasts

several hours. Taken into the stomach in small quantities, it produces no sensible inconvenience for some time; but if large doses are given, or the small ones long continued, heartburn, nausea, and vomiting result, and sometimes inflammation and mortification, especially when it has been taken *medicinally* for six months or longer. Its absorption into the system produces a blueness, slate color, or bronze hue of the skin, which is very difficult to remove. In some cases the whole body, internally and externally, has been *blue-dyed* by the medicinal operation of this drug. The discoloration results from a chemical combination of the salt with the organic tissues.

Treatment.—When the drug has been recently taken into the stomach, common table salt will decompose it and render it comparatively inert. When the body has been pretty well saturated with it, a long course of hydropathic bathing and dieting will be necessary, even to get rid of its effects partially.

Gold—Aurum.—The morbific and medicinal effects of the preparations of the *rex metallorum*, as the alchemists termed gold, are similar to those of the mercurials, though they are generally more sudden and violent. Gold has been administered in the state of minute division—*pulvis auri*—and in the forms of *iodide*, *cyanide*, and various *chlorides*. A preparation, called *fulminating gold—aurate of ammonia*—has been experimented with considerably; and writers on materia medica tell us with sufficient *coolness*, that "it has produced very serious and even fatal results."

Treatment.—The antidotes are albumen, flour and milk, as in the cases of corrosive sublimate and the preparations of copper.

Iron—Ferrum.—A very strange and general delusion pervades the medical profession respecting the medicinal virtues of this metal. Some chemists have detected, or imagined they have detected, a little of it in human blood; and, making a spring-board of this fact, have *jumped* to the conclusion that iron was a great remedy for a great many diseases. Even our "botanic," "eclectic," and "physopathic" co-reformers, who are so justly horrified at the idea of mercurial and antimonial poisoning, very freely mingle chalybeate waters and ferruginous salts and oxides in the preparation of their purifying syrups, alterative mixtures, and tonic powders. If it be true that iron is in some form a natural constituent of the human body, it does not by any means follow that the preparations of the metal which are found in the pharmacopœias are natural remedies, or remedies in any sense; nor does it follow that because phosphate and carbonate of lime are found in the

cones, that common chalk, mason's mortar, or plaster of Paris are natural foods!

As iron was the first mineral introduced into medicine, the history—all we have on the subject—of its introduction may not be uninteresting: "Melampus, a shepherd, supposed to possess supernatural powers, being applied to by Iphicles, son of Philacus, for a remedy against impotence, slaughtered two bulls, the intestines of which he cut to pieces, in order to attract birds to an augury. Among the animals which came to the feast was a vulture, from whom Melampus pretended to learn that his patient, when a boy, had stuck a knife, wet with the blood of some rams, into a consecrated chestnut-tree, and the bark had subsequently enveloped it. The vulture also indicated the remedy, namely, to procure the knife, scrape off the rust, and drink it in wine for the space of ten days, by which time Iphicles would be lusty, and capable of begetting children. The advice thus given by Melampus is said to have been followed by the young prince with the most perfect success!"

Iron is employed medicinally in the forms of *filings; black oxide*, or *ethiops martial; sesquioxide*—the *red oxide*, *peroxide*, or *crocus martis*, various preparations of which are known as *carbonate of iron. vitrioli*, *brown-red*, *rouge*, etc.; *hydrated sesquioxide; ammonio-chloride; iodide; sulphuret*, or *common iron pyrites; ferro-sesquicyanide*, or *Prussian* or *Berlin blue; ferro-cyanide of potassium*, or *Prussiate of potash; sulphate—green vitriol—sal martis—copperas; ferro-tartrate of potash; acetate; persulphate; pernitrate; ferro-tartrate of ammonia; lactate*, and *citrate*.

Symptoms.—The effects of the different preparations are exceedingly various, both in quality and degree. A few of them are violently irritating; but the majority are among the slow and insidious poisons. Small doses generally constringe and harden the fibres, constipate the bowels, and blacken the stools, and even reduce the size and harden the structures of various glandular viscera, as the liver and spleen. Like nitrate of silver, they form compounds with the organic tissues. They increase for awhile the frequency and force of the pulse, augment the temperature of the body, and heighten the color of the cheeks: effects indicative of fever and irritation, but which are usually regarded as remedial. Unfortunately the general and preternatural excitement is, ere long, followed by corrresponding sinking and depression. The sulphate and chlorate of iron, in large quantities, produce great heat, weight, pain and uneasiness in the stomach, with nausea, vomiting, and sometimes purging and hemorrhages.

Treatment.—We have no chemical antidotes except the alkalies,

chalk, magnesia, etc., when the sesquichloride has been swallowed. This is usually obtained at the apothecary shop in the form and under the name of *muriated tincture of iron*. Against all the other preparations we must trust to warm-water vomiting, the stomach-pump, and the usual means for counteracting inflammation.

Zinc—Zincum.—The compounds of zinc are analogous to those of copper in their action on the system, though somewhat less violent. The preparations in common use are the *oxide—flowers* of zinc; *impure oxide*, or *tutty*; *chloride—muriate*, or *butter of zinc*; *sulphate*, or *white vitriol*; *acetate*; *carbonate*, or *calamine*; and *cyanide*. The treatment is the same as in cases of copper poisoning

Manganese—Manganesium.—The *binoxide* of this metal has been sometimes used in medicine. It is employed by potters to color earthen-ware; by glass-makers to destroy the brown color produced by iron, and to give an amethystine tint to plate glass; and by bleachers to produce chlorine. It has also been used as a depilatory. Its effects on the human system are more severe than those of iron, but less injurious than lead, and they are to be counteracted like those of the preceding poisons.

Iodine—Iodinum.—This is an intense and acrid irritant. In large doses or small doses long continued, it causes a burning pain in the stomach, a colliquative and exhausting diarrhea, with a rapid emaciation of the whole body, and extreme prostration of the whole system. Its destructive action seems to be particularly determined to the glandular structures. In some cases the male testes, and in others the female breasts, have been nearly absorbed and entirely destroyed by its medicinal employment. Its principal preparations are the *hydriodate of potassa*, which is extensively used in preparations called "sarsaparilla," and is a frequent cause of paralytic limbs and weak joints; and various combinations with sulphur and mercury, which are violently corrosive. Unfortunately we are without antidotes once more, and must trust to the principles of treatment already explained.

Phosphorous.—This article is in less repute for medicinal purposes at the present day than it was some fifty years ago. It is a powerful irritant, and its acid is corrosive. The antidotes are demulcents and alkalies—albumen, gluten, milk, magnesia, etc.

Sulphur.—Various forms of this article are familiarly known as

brimstone, *flower of sulphur*, *roll* or *cane sulphur*, *balsam of sulphur milk of sulphur*, etc. Their action on the animal economy is weak in small doses, producing chiefly those effects which are called laxative and diaphoretic. Its principal celebrity in medicine has been obtained from its success in curing the itch.

Very large doses of sulphur sometimes produce severe griping and purging, with great debility, the treatment for which is the same as for an ordinary diarrhea.

CHROME—CHROMIUM.—The *chromate of potass*, and some other salts of this metal, are extensively employed in dyeing. When taken into the stomach, they produce the usual vomiting, griping, and purging effects of other mineral poisons; but they are peculiarly liable to be followed by a degree of debility and paralysis wholly disproportioned to the irritant effects. The treatment should be the same as for lead poisoning.

BROMINE—BROMINUM.—This substance has been employed medicinally as a substitute for iodine, to which its operation is similar; and when poisoning results from it, the treatment is the same.

ALUM—ALUMEN.—Taken internally, alum corrugates the fibres, diminishes the secretions, creates dryness and thirst; and when large quantities are swallowed, nausea, vomiting, griping, and purging succeed. The remedies are, warm water and the stomach-pump.

PLATINA—PLATINUM.—Some preparations of this metal, as the *bichloride* and *chloroplatinate of sodium*, have been used in medicine and the arts. Their action on the human system resembles that of the preparations of gold; and their antidotes are the same.

BARYTES—BARIUM.—The *carbonate*, *chloride*, and *nitrate* of this metal produce effects on the human system hardly distinguishable from those of arsenic. The chloride has been administered in scrofulous cases. The antidotes are alum, and the sulphates of magnesia, lime, and soda, which form an insoluble salt or sulphate of baryta.

METALLIC SALTS AND OXIDES.—There are many preparations of metals which it would be tedious to enumerate, which are irritant and corrosive poisons of greater or less intensity; their effects are analogous to those of arsenic, copper, and lead, and in all cases of poisoning from them, our main reliance must be on vomiting and the stomach-pump; the albumen of eggs and gluten of wheat are always harmless

and in some cases might be serviceable; hence it would be at least prudent to employ them in all cases as auxiliaries. Among the most dangerous may be named the *oxide of osmium* and *hydrochlorate of palladium*, which are nearly as active as arsenic; the *hydrochlorates of rhodium* and *iridium* are rather less violent; the salts of *molybdenum* are comparatively feeble; *uranium* and *cobalt* are more active; *tungstein*, *cadmium*, *nickel*, *cerium*, and *titanium*, in their various preparations, are among the weakest of the metallic poisons.

Narcotics.—These may be medicinally and toxicologically divided into the pure, stimulant, and acrid. The *pure narcotics* produce stupor, insensibility, nervous prostration, paralysis, convulsions, etc., *directly*, and without previous excitement, as *Prussic acid*, *henbane*, *belladona*, *strammonium*, *conium*, *cicuta*, *ergot*, *narcotine*, *lettuce*, *pink*, *cherry laurel*. The *stimulant narcotics* produce at first more or less nervine excitement or exhilaration, with an increased action of the circulating system, followed by torpor, depression, debility, stupor, and all the symptoms of ultimate narcosis. To this division belong *opium* and and its various preparations of *morphine*, *meconic acid*, *codeïa*, *laudanum*, *paregoric*, *black drop*, *Godfrey's cordial*, and *wine of opium*; *alcohol* in all its forms of intoxicating *malted*, *fermented*, or *distilled liquors*; *tobacco*, *camphor*, *cocculus indicus*, *nux vomica*, *St. Ignatius' bean*, etc. The *acrid narcotics* produce violent irritation and inflammation in the stomach and bowels, followed by stupor, delirium prostration, etc. Among them may be named as prominent, *mezereon*, *squills*, *serpentaria*, *cantharides*, *elaterium*, *colchicum*, *gamboge*, *jalap*, *scammony*, *colocynth*, *celandine*, *croton oil*, *bryony*, *savin*, *spurge laurel*, *aconite*, *bitter almonds*, *arnica*, *arum*, *rhus*, *cowhage*, *anemone*, *marsh-marigold*, *daffodil*, *fools' parsley*, *seeds of the castor-oil tree*, *bitter-sweet*, *five-finger root*, *black*, *white*, and *green hellebore*, *meadow saffron*, *rue*, *ipecacuanha*, *yew*, *darnel-grass*, *creasote*, etc.

Treatment.—All cases of narcotic poisoning demand the stomach-pump or warm water emetic, or both, in the first instance; the ulterior symptoms will be those of inflammation, partial apoplexy, or complete asphyxia, denoted by tremors, stupor, or insensibility, coma, delirium, convulsions, partial paralysis, etc. In this stage the treatment is nearly the same as for apoplexy. The extremities must be kept warm with hot bottles, gentle but persevering friction applied to the surface, and the cold pouring-bath applied to the head; this last is indeed the most important part of the treatment. Inflammatory symptoms are to be treated on general principles. When an exhausting diarrhea attends as from colchicum or elaterium, the cold bandage and hot foments-

tions may be necessary, and may alternate with advantage, and small quantities of very cold water are to be frequently thrown up the rectum.

Acrids.—There are many aromatic and pungent vegetable substances not usually regarded as poisonous, but which, when taken in large quantities, produce severe irritation, and even fatal inflammation of the stomach and bowels. Of this class are the *essential oils*, as *peppermint*, *spearmint*, *cloves*, *cinnamon*, and *capsicum*; various *balsams*, as *Tolu*, *copavia*, *Canada*, and *Peru*; many condiments, as *pepper*, *mustard*, *horse-radish*, *cloves*, and *nutmegs*; to which may be added *turpentine*, *oil of tar*, *cubebs*, and two or three hundred medicines belonging to the classes of *cathartics*, *diuretics*, *diaphoretics*, *vermifuges*, *emmenagogues*, etc. The action of these articles on the system, or rather, the resistance of the vital powers to their action, is not accompanied with the indications of nervous prostration or exhaustion peculiar to the narcotics proper; hence our treatment is limited to soothing irritation and combating inflammation, premising, however, that the offending material is in all cases to be got rid of by emesis, catharsis, etc., as speedily as possible.

Mushrooms.—The *fly agaric*, *pepper agaric*, *deadly agaric*, *bulbous agaric*, and *champignon*, are the kinds of mushrooms from which poisoning most frequently results. They produce nausea, heat, and pain in the stomach and bowels, thirst, vomiting, griping, and purging; in severe cases, convulsions and faintings are frequent, with small and frequent pulse, delirium, dilated pupil, and stupor, followed by cold sweats and death.

Treatment.—Here again the *scientific* treatment of the books is eminently calculated to make a very bad matter very much worse: "emetics of tartar emetic, followed by large doses of Glauber or Epsom salts." As these drugs have no antidotal property in the chemical sense, and as their employment is powerfully debilitating, they are as injudicious a selection for puking or purging purposes as it is possible to make. Warm water and the stomach-pump, with copious tepid injections, are our more rational practice.

Poisonous Fish.—The kinds of "sea-food" from which poisoning most frequently happens, are, the *crawfish*, *mussel*, *old-wife*, *yellow-billed sprat*, *land-crab*, *gray-snapper*, *dolphin*, *hyne*, *conger-eel*, *blue-parrot fish*, *smooth-bottle fish*, *grooper*, *rock-fish*, *barracuda*, *king-fish*, *Spanish mackerel*, *porgee*, *bonetta*, *blower*, *tunny*, etc. The symp-

toms of poisoning usually appear in an hour or two after eating them, but sometimes in a few minutes after the meal is finished; a weight at the stomach is at first felt, with slight vertigo or headache; these are followed by a sense of heat about the head and eyes, great thirst, and an eruption of the skin resembling urticaria, or nettle-rash.

Treatment.—This has already been given under the head of *erythema.*

Serpents and Insects.—Those serpents and insects whose bites or stings are poisonous, are, the *copper-head*, *moccasin*, *viper*, *black viper*, *water viper*, *rattlesnake*, *Spanish* or *blistering fly*, *potato fly*, *tarantula*, *scorpion*, *hornet*, *wasp*, *bee*, *gnat*, and *gad-fly*. All the symptoms are those of violent internal and external erythematic inflammation, and the treatment may be found also under that head.

PART VII.

SURGERY.

Definitions.—Surgery is either medical, mechanical, or operative. According to the old school system, *medical* surgery comprehends the internal administration of drug-remedies, and the external application of lotions, liniments, poultices, plasters, etc. In the hydropathic system medical surgery is limited to the internal and external employment of water of every temperature, from steam to ice, as the indication is to induce relaxation or excite contraction; the internal administration of chemical antidotes or correctives in cases of poisoning, and the local application of astringents, caustics, and emollients, for the purposes of constringing bleeding vessels, removing preternatural formations, or destroying infectious matter, and protecting abraded or ulcerated surfaces from atmospheric and thermal influences. *Mechanical* sugery is applied to the replacement of displaced parts. *Operative* surgery contemplates the removal of mechanical or chemical obstructions, and morbid structures.

CHAPTER I.

SURGICAL APPLIANCES.

It has been said that a good workman requires but few tools; a good doctor needs but few medicines, and a good surgeon requires but a very small part of the multitudinous instrumental machinery which the inventive genius and manufacturing interest of the age has brought into use.

The common *pocket-case* of instruments, with tooth-forceps, ligatures, lint, adhesive plaster, sponge, bandages male and female catha-

ters, the stomach-pump, and the pump-syringe, are all that emergencies demand to be kept always in readiness.

The necessary mechanical, medical, and chemical appliances—rejecting all internal drug-medicines—are, the compress, ligature, sponge, adhesive plaster, lints and pledgets, dry-cupping, bandages, splints, caustics, sutures, torsion, the tourniquet, refrigeration, fomentations, emetics, anæsthesia, hæmastasis, and transfusion.

The Compress.—This is employed to equalize pressure under a roller or bandage, or increase the pressure at a particular point. It is made of several folds of linen, formed into a kind of pad; various shapes and thicknesses of compresses are employed, to suit the particular locality and circumstances. For applying around a sore, the *perforated* compress is constructed with a hole in the centre to permit the escape of matter. In Water-Cure parlance a *wet cloth* is often called a compress; but in the strictly surgical sense, a compress is connected with the idea of *compression*.

The Ligature.—Various kinds of *strings* or *ligatures* are employed to arrest the bleeding from wounded or divided blood-vessels, check the venous circulation so as to retard or prevent the absorption of poison, as in the case of bites of venomous animals, remove tumors, etc. Silk, linen, and animal membrane—cat-gut—are the materials in use. The latter is preferable, especially for tying bleeding arteries or veins, as both ends may be cut off close to the wound, and the rest left to decomposition and absorption. In applying the ligature to wounded vessels, the *surgeon's knot*—the first knot having *two turns*—must be tied, as this prevents the first knot from slipping while the second is being tied. The bleeding vessel should be gently raised with the forceps or tenaculum, and the ligature drawn as tightly as may be without cutting through the coats of the vessel. Silver wire is sometimes used in ligating polypus and other tumors.

The Sponge.—For surgical purposes the finest and softest article is the best. It is used to absorb the blood and other fluids from wounds and ulcers, and to support temporarily prolapsed parts, as the uterus.

Adhesive Plaster.—This is employed to retain divided parts in proximity; to afford mechanical support to relaxed and distended vessels, as varicose veins; to excite absorption by compression, as in indolent ulcers, and protect abraded surfaces. In dressing wounds, it is applied in narrow strips, with interspaces for the discharge of matter. For

small cuts or abrasions, the *collodion* is the most convenient article, and for very small wounds or sores the gummed-silk or *court-plaster* is sufficient. Where adhesive plaster is to be applied, the hair should be shaved off.

Tents and Pledgets.—These are conical or cylindrical masses of *charpie*, or prepared lint—best made by scraping the fine nap from old linen—or sponge, some sizes and forms of which are called *meshes*, *rolls*, and *pledgets*. They are employed to keep up a discharge from a fistulous or sinuous ulcer, so as to secure granulation from the bottom of the sore; to introduce caustics and irritants; to absorb matter, etc. *Tampons* are large tents, for making pressure or applying distention to arrest hemorrhage. The sponge-tent is the most convenient when absorption is desired; the common puff-ball, or silk pocket handkerchief, are frequently employed in uterine hemorrhages.

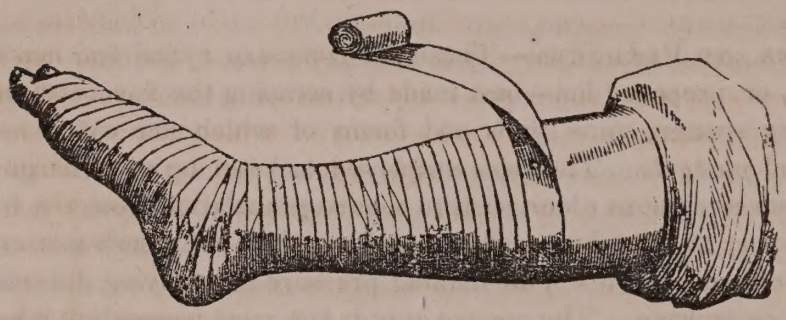
Dry-Cupping.—The application of any convenient vessel, as a common tumbler, to the surface, in which a piece of cotton is burned to produce a vacuum, is employed to diminish the circulation in the adjacent vessels, and to abstract the irritation of an inflamed part, on the principle of counter-irritation. This process is preferable to local bleeding—wet-cupping—and generally produces momentary relief of pain. But I regard it as hardly worth retaining for such purposes, for the reason that cold applications to the part, with warm, if need be, at a remote part, is a better resource in nearly if not quite all local inflammations. Dry-cupping is a valuable resource in reducing inguinal and femoral hernia.

Bandages.—The most common use of bandages is to maintain the fragments or parts of broken bones in juxtaposition during the healing or *knitting* process; to give support to parts after recent dislocations; to promote circulation, and prevent accumulation in chronic swellings of the lower extremities, as in œdema, varices, old, deep, indolent ulcers, etc. The best are made of firm, smooth, unbleached linen cloth, torn into narrow strips, and sewed together by overlapping the ends so as to avoid a seam. The bandage must always be smoothly and evenly applied, and great care must be exercised to avoid drawing it tighter above, or toward the heart, than below, as congestion and swelling will result from obstructing the circulation.

Figure 190 shows the manner of applying the *roller* to the lower extremity. It is about two and a half inches wide; and, commencing at the extremity of the great toe, takes in the second toe at the second

turn, the third toe at the third turn, and so on; compresses are placed in the depressions around the ankle so as to preserve equal pressure.

Fig. 190.



APPLICATION OF THE ROLLER.

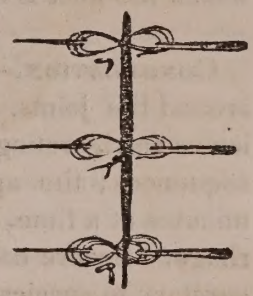
each layer overlaps the preceding two thirds or more of its width, and the whole is applied smoothly from the toes to the knee. Just above the ankle, where the limb is tapering, it has to be folded over itself, and its direction frequently changed to preserve its evenness of application.

Splints.—These are employed in cases of fractures, and sometimes to correct deformities. They are made of thin pine or poplar, cedar or basswood boards; or better still, by saturating woolen cloth with gum shellac. They must, of course, be shaped to the part to which they are intended to be applied, and padded with lint, cotton, or lined with soft sheepskin or buckskin.

Caustics.—The red-hot iron, called the *actual cautery*, is sometimes resorted to for the destruction of morbid parts; but more commonly some chemical substance, called the *potential cautery*, is employed. *Caustic potash—potassa fusa*—is in general use as a *strong*, and the *sesqui-carbonate of potash* as a *mild* caustic. *Nitrate of silver—lunar caustic—nitric acid*, and *sulphate of zinc*, are frequently employed. Preparations of *antimony*, *arsenic*, and *mercury*, are favorite eschoratics and caustics with allopathic practitioners, but they have already done mischief enough to entitle them to future oblivion. Mild caustics will generally remove callous or fungous growths without destroying the healthy structure; and the strong is necessary when the healthy parts are so involved with the disease that some portion of sound structure must be sacrificed to get rid of the morbid. Fortunately this necessity is of rare occurrence.

SUTURES.—*Stitching* divided parts together is much less practiced now than formerly—superior skill in the management of bandages and adhesive straps having superseded, in a great measure, its necessity. Sutures are mostly employed to restrain the mobility of parts, and prevent permanent contraction of the muscles, in situations where straps and bandages cannot be well applied. The curved needle should always be passed from within the wound outward, and take up but little more than the skin. The *twisted* suture is employed for the double purpose of adaptation and compression. After the needle or pin has transfixed the lips of the wound, the thread is applied in successive coils round under the point and head, as in fig. 191. The *interrupted suture* is made by passing the threaded needle through the edges of the wound, at short distances, and then removing the needle and tying the thread. In the *dry suture* the needle is passed through strong bands of adhesive plaster, which are placed above and below the wound.

Fig. 191.

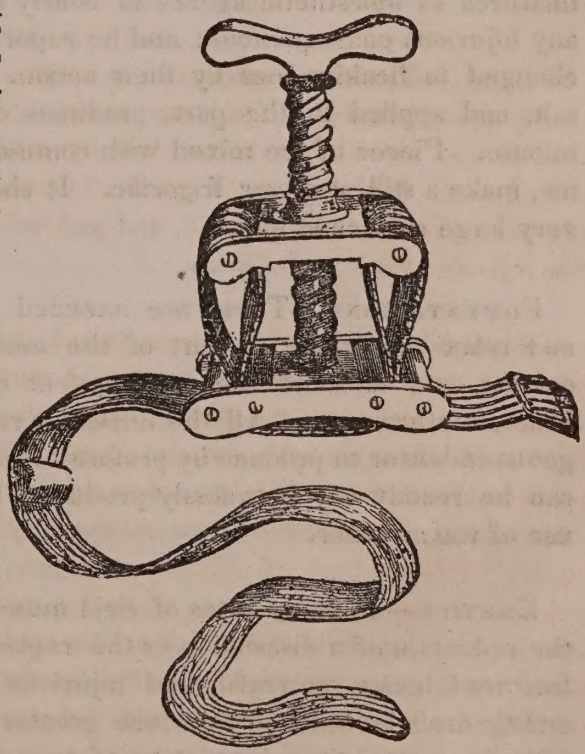


TWISTED SUTURE.

TORSION.—This process merely consists in getting hold of the extremity of the bleeding vessels with a pair of forceps, and *twisting* them. It stops the bleeding of small arteries, and is so far a substitute for tying.

THE TOURNIQUET.—This instrument is a form of ligature, and is calculated to compress large and deep-seated arteries in amputations and other exigencies. The *pad* or *compress* is applied directly upon the artery above the injury or operation, and pressed upon the vesse until the pulsation of the artery beyond is suppressed, by turning the screw. A

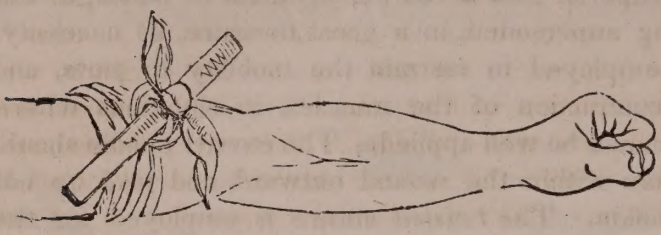
Fig. 192.



THE TOURNIQUET

good substitute for the common tourniquet may be made in a moment in various ways. A handkerchief, tied twice around the limb, may be twisted with a stick until the pressure stops the current of blood in the artery against which the knot is applied, as in fig. 193.

Fig. 193.



HANDKERCHIEF LIGATURE

CONGELATION.—In deep-seated chronic inflammations, especially around the joints, *absolutely freezing* the part, by means of pounded ice or refrigerating mixtures, has been attended with the happiest consequences; the application should never be continued but for a few minutes at a time. It is also one of the means for restraining hemorrhage. Severe cold has been employed to remove the sensibility, preparatory to surgical operations; and the testimony is unanimous that, in every instance "the wound has appeared to heal more speedily than under the usual circumstances." Dr. Arnott has used frigorific mixtures as anæsthetic agents in nearly two hundred cases without any injurious consequences; and he reports that foul ulcers are often changed to healthy ones by their action. A piece of ice dipped in salt, and applied to the part, produces congelation in about half a minute. Pieces of ice mixed with common salt and nitrate of ammonia, make a still stronger frigorific. It should never be applied to a very large surface at once.

FOMENTATIONS.—These are intended to abate morbid sensibility, and relax the whole or part of the muscular system, to overcome spasms, and facilitate the replacement of luxated joints, fractured bones, ruptures, etc. All the muscular relaxation which *regular* surgeons endeavor to produce by profuse bleedings and deathly nauseants, can be readily and harmlessly produced by the internal and external use of warm water.

EMETICS.—In many cases of rigid muscular contraction, to facilitate the reduction of a dislocation or the replacement of the fragments of fractured bones, powerful and injurious doses of tobacco or tartar emetic are administered to induce greater relaxation; or the patient is kept for a long time in a state of excessive nausea. Warm water, taken copiously into the stomach, assisted by tickling the throat occa-

sionally, will answer all the purposes for which so many deathful drugs are employed, especially if conjoined with external fomentations or the warm-bath.

Anæsthesia.—Chloroform and ether are just now in common use to produce insensibility, and thus obviate the pain attending surgical operations; and many surgeon accouchers administer chloroform to lessen or obviate the pain in nearly all cases of parturition. They are not without danger, and the introduction of these agents into ordinary obstetric practice is to be reprobated. When an operation is exceedingly dangerous, painful, or protracted, the employment of anæsthetic agents is certainly commendable; and, although we have accounts of some thirty deaths occurring from their direct effects since their introduction into surgical practice, yet I suspect that some of those deaths at least, were attributable to a want of the proper precautions, or rather an ignorance of the proper precautions on the part of the operator. The same rules should be observed in administering chloroform or ether, as are enjoined by hydropaths in administering a full-bath. The stomach should be empty; the patient in his ordinarily quiet or composed state; that is, without rush of blood to the head, or determination to the brain; the extremities must be warm, and a general glow upon the surface, etc. The ether is the safer article, but the chloroform is the most powerful. In many cases magnetism will produce the desired insensibility, and when the patient is susceptible, this process is always to be preferred.

Hæmastasis.—This process has been employed in the treatment of local congestion and inflammation; but we have, in water of various temperatures, an ample and a better resource. It is a valuable expedient, however, in some cases of sudden and alarming hemorrhage, as it enables us to retain a greater proportion of blood within the body, and also to lessen its impetus at the bleeding point, thereby favoring the formation of a clot or coagulum. Dry-cupping an entire limb, for which purpose elongated cylinders of flexible material have been invented, is one method of holding back its blood. The common ligature round the limb is equally efficacious.

Transfusion.—In some cases of excessive loss of blood, life has been preserved by opening the vein of a healthy person, or of a sheep, and transferring the blood immediately into the vein of the bleeding patient, a suitable vessel or funnel being connected with the latter for the purpose of receiving it.

CHAPTER II.

WOUNDS.

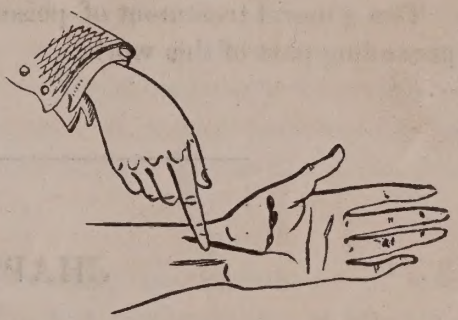
Distinctions of Wounds.—The usual division of wounds is into incised, punctured, penetrating, contused, lacerated, gunshot, and poisoned. An *incised* wound is a simple *cut*, made, of course, by a sharp-edged instrument, as a knife, razor, axe. A *punctured* wound is made by a sharp-pointed instrument, as a needle, awl. A *penetrating* wound is a larger puncture, as by a bayonet. A *contused* wound is occasioned by a blunt instrument, as a stone, club, which injures the parts below the surface, the skin remaining entire. A *lacerated* wound is inflicted by an instrument which is both blunt and rough, and which tears the integument as well as injures the parts beneath it. *Gunshot* wounds include all injuries accruing from substances impelled by the explosive force of gunpowder, as leaden bullets, cannon balls, stones, etc. They partake of the character of both punctured and lacerated wounds. *Poisoned* wounds are the injuries inflicted by insects, reptiles, rabid dogs, etc., whose stings or bites are accompanied with the introduction of a specific virus.

General Consequences of Wounds.—*Bleeding* is the only alarming symptom in incised wounds, which can generally be healed by the "first intention," that is, without suppurating. All the other varieties are attended, save when very large arteries are torn, with but little hemorrhage, but always *suppurate* more or less. In gunshot wounds, the *concussion* of the air impelled by the ball often inflicts severe injury, without making any mark upon the skin. In most wounds there is more or less *extravasation*, or an infiltration of blood into the cellular membrane. The *pain* is generally in the inverse ratio to the danger, for the reason that the more destructive the injury, the less power has nature to give the alarm. The danger of wounds, other circumstances being equal, depends on the actual health, or physiological state of the system at the time the wound is received. The most trivial scratch, or the simplest cut, has been followed by bad sores, loss of limb, and even life, in persons of extremely morbid blood, foul secretions, and reduced vitality; while those of sound, pure bodies, recover from the most complicated injuries with comparatively little dif-

ficulty. Spirit-drinkers and beer-bibbers are notoriously liable to extreme inflammation, foul ulcers, mortification, etc., from injuries which water-drinkers might regard as trifles.

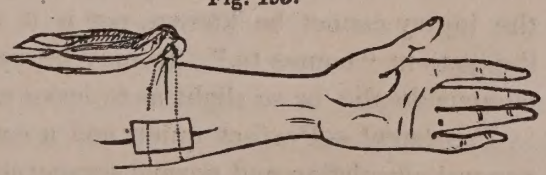
TREATMENT OF WOUNDS.—The first point, in all cases, is to control the hemorrhage. *Arterial* bleeding, which is always far the most dangerous, may be known by the bright scarlet color of the blood, and its issuing in jets. It may be stated as a general rule, probably an invariable one, that all hemorrhage from blood-vessels below the wrist and ankle, can be arrested without ligating the arteries. The injured part should be freely exposed to the cold air, and washed in the coldest water. In many cases the bleeding from small vessels is kept up by the dressings—covering the wound with compresses, lint, etc., which keep up the heat, and prevent the formation of a coagulum. I have known a deep wound in the thigh, made by a piece of glass, bleed for several days in spite of lint, and sutures, and bandages, and cease entirely on being laid open with a scalpel with a view of tying the wounded artery, which, by the way, was not found. In some cases the wounded artery can be compressed by the finger, as the radial artery in fig. 194. If the pressure must necessarily be kept up a long time, a piece of soft rag several times folded may be placed over the aperture, and secured by a piece of broad tape, bandage, or pocket handkerchief, as in fig. 195. When internal bleeding occurs, known by paleness, faintness, etc., sips of the coldest water or bits of ice should be frequently swallowed, and absolute quiet enjoined. Bleeding from large arteries must be controlled by the tourniquet, and the artery ligated. When the bleeding is from the upper extremity, the brachial artery must be compressed above the middle of the arm; and if from the lower, the femoral artery should be compressed just below Poupart's ligament.

Fig. 194.



COMPRESSING THE RADIAL ARTERY.

Fig. 195.



THE COMMON COMPRESS.

The *congestion* and *inflammation* which may attend all wounds merely require frequent changes of the water-dressings; and when the inflammation of a wound has extended to the neighboring glands, producing painful

swellings, these should be kept well covered with several thicknesses of wet cloths.

The lodgment of foreign substances in wounds is to be ascertained by introducing the finger or a probe, and extracted if possible; not, however, until all danger from hemorrhage is past; and when poisonous substances are imbedded in the flesh, warm water or neutralizing solutions should be frequently injected.

In *suppurating* wounds the edges must be kept apart, to allow free egress to all matter that may form within; and if the granulations, in the healing process, arise above the surface, and become loose and flabby, constituting *fungous* or *proud flesh*, straps of adhesive plaster or collodion should be applied to act as a compress. In bad cases caustic potash may be necessary.

Secondary hemorrhage is liable to occur in lacerated wounds from the sloughing of large arteries; and in bad cases, *gangrene*. They require the coldest water-dressings. The moderate douche is excellent in contused wounds; and when they become irritable and painful the part may be bathed in warm water, followed by the cold compress. The absorption of extravasated blood may be promoted by the cold streams and cold wet compress.

The general treatment of poisoned wounds has been detailed in the preceding part of this work.

CHAPTER III.

INJURIES.

CONCUSSION.—A *stunning*, or *concussion of the brain*, is the result of blows upon the head, or of falls, which so shock the whole system as to occasion a temporary suspension of consciousness. The extent of the injury cannot be known, nor is it material that it should be until the patient "comes to." It may be so severe as to produce instantaneous death; or so slight as to leave no apparent ill consequences.

Treatment.—Perfect quiet, and a careful attention to keep up the general circulation and normal temperature, are the principal remedial resources. The extremities must be kept warm, cold cloths should be laid over the head, and if the concussion is prolonged, the bowels may need evacuating by means of injections, and the urine require to be drawn off by the catheter.

The old practice of bleeding, which I am sorry to know is also a common practice with modern allopaths, has no better effect than to lessen the patient's chance of recovery. Indeed, this has been the opinion of some of the best European surgeons for the last fifty years, and a majority of all modern authorities is against the practice; besides, it is in itself at variance with common sense; yet our doctors continue the killing practice of letting blood as though there was some scientific reason for it!

Compression.—This is usually the result of concussion, and its immediate cause is an extravasation of blood within the cranium; or some collection of other matter; or mechanical pressure from a depressed or broken part of the skull bones. It is denoted by continued pain in the injured part of the brain, with cerebral disturbance; or, in the absence of these, frequent faintings, spasms, disordered vision or hearing, with nausea and vomiting. The patient is often also comatose.

Treatment.—When a portion of the cranium is depressed it must be raised by a lever; or if this is impracticable, the operation of trephining will become necessary. The head should in all cases be kept thoroughly cooled with wet cloths or the pouring-bath, and derivative treatment, especially tepid, hip, and foot-baths should be frequently employed, caution being taken to secure prompt reaction. In extreme cases, hot foot and leg-baths are useful, especially when the patient is affected with delirium or coma. In young persons very bad fractures of the cranial bones will often replace themselves if the general health is well attended to.

Bruises.—These are only worth naming for the purpose of mentioning that the cold douche, and the wet compress, are worth more than all the stimulating liniments and embrocations in the world, in their treatment.

Strains.—These accidents usually happen to the smaller joints, as the wrist, fingers, ankle, and toes; they are generally exquisitely painful, and are very liable to be followed by painful and protracted inflammation. The part should be held in cold water, or the cold stream applied to it until the violence of the pain abates, and then wrapped in wet compresses until all inflammatory excitement is passed.

Burns and Scalds.—Burns are produced by the action of concentrated heat upon the living tissue. *Scalds* are produced by the application of a boiling or hot fluid. The danger of these injuries is usually

measured by the extent of surface destroyed. Authors make three, four, five, and sometimes six degrees of burns; but the smallest number is sufficient for all practical purposes. The first is *rubefaction*, or *redness;* the second, *vesication*, or *blistering;* and the third, *disorganization*, in which the skin is destroyed, and perhaps some structures beneath the skin. The pain is usually the severest in the second variety. Superficial burns or scalds are easily healed when not maltreated; but deep burns, as by a hot iron, usually leave an ugly scar Many terrible burns are frequently taking place by the clothes of women, children, and servants taking fire from carelessness in handling camphene, burning fluid, tea-kettles, coffee-pots, etc.

Treatment.—When one's clothing is on fire, the first thing to be done is to extinguish the flame; and as the sufferer might burn to death before a supply of water could be obtained, the flame should be suffocated by covering the patient with a blanket, carpet, or some similar

Fig. 196.

article, as represented in fig. 196. The next point of treatment is to immerse the injured part in water, or cover it with wet cloths of the temperature which feels most agreeable to the patient. The coldest water will prove the most soothing at first; and in a longer or shorter time, according to the severity of the inflammation, tepid water will be found most sedative; and finally warm water will often feel the best. But the rule is invariable: follow the sensations of the patient. When the skin is vesicated, it should be kept covered with soft linen. The blisters which form should not be punctured or torn until suppuration has taken place on the surface, as they form the best protection to the injured surface.

As the contact of the atmosphere, or rather of a colder medium, is excessively painful to the raw surface after the skin or cuticle comes off, the room should be kept quite warm, and all applications should

then be moderately warm. The best covering in this condition is simple flour, dredged over the surface, allowed to remain until it becomes loose by the purulent matter beneath, then removed, the surface gently washed with warm water, and more flour applied. A soft cloth may be placed over the flour and kept continually wet with water; and the flour-dressing may be continued until cicatrization is completed. I have seen very bad burns heal rapidly and admirably under this management: starch, and finely-pulverized slippery elm bark—elm flour—are favorite applications with some practitioners, but I know not that they have any advantage over the common flour.

There is always a considerable degree of constitutional disturbance after a severe burn, as rigors, oppressed respiration, small, weak pulse, followed by more or less febrile reaction. This requires warm hip and foot-baths, when practicable, during the period of chilliness, and tepid ablutions during the febrile stage; the room should always be kept considerably warmer than in cases of the same violence of fever from any other cause.

The allopathic treatment of burns and scalds is a singular jumble of the "good, bad, and indifferent." Professor Parker, of this city, after telling us that "the treatment of scalds and burns seems to us to be eminently empirical in all our systematic works on surgery," gives us a *rational* basis of treatment. This is "the use of such agents as are calculated to meet the existing debility." "The most prominent of the local and constitutional symptoms is great *nervous prostration*." On this basis the professor recommends *warm brandy* and *tincture of opium* to get up reaction; and then *antimony*, *Dover's powder*, *calomel*, and *ipecacuanha*, to get the reaction down again; or, in his language, "regulate the reaction, that it may not run too high." "General bleeding," he continues, "is commonly indicated by the great tendency in such cases to a typhoid condition of the system." Bleeding indicated because the nervous system is *prostrated*, and the whole system in a *sinking* condition! Is not this pre-eminently empirical?

Among the *sequelæ* of burns and scalds, are contractions of the skin and adhesions around the tendons, producing distortions and deformities. These must be prevented, as far as possible, by maintaining the normal position of the parts during the healing process. Dr. Parker remarks: "When these scalds and burns are upon the trunk, and there has been a copious suppuration, unless we are guarded in our treatment, as cicatrization takes place and the secretion is diminishing, there will occur suddenly and unexpectedly, effusion upon the brain or lungs, and death." The way to "guard" against such disastrous results is, by avoiding the drugging and bleeding part of the treatment.

Particular Wounds and Injuries.—*Venesection—phlebotomy*—is a wound made by puncturing a blood-vessel with the point of a lancet, a ligature having been previously applied between the contemplated wound and the heart. Some one of the veins or the inner side of the fore-arm, near the elbow, is usually selected; but occasionally the external jugular vein, the veins of the foot, and the temporal artery are opened. The consequences of this operation are, 1. Loss of blood, which is irremediable. 2. *Ecchymosis*—a livid, hard tumor, occasioned by an extravasation of blood into the cellular membrane, in consequence of the wound in the vein not exactly corresponding with that in the skin; it requires the cold douche and cold compresses. 3. *Aneurism*—an arterial swelling, produced by pricking through the vein into the adjacent artery, or missing the vein with the point of the lancet and hitting the artery; this requires the operation of ligating the artery above the injury. 4. *Lock-jaw*—produced by pricking or dividing some nerve in the vicinity of the *venesected vein*; it requires the treatment heretofore mentioned under the head of Spasmodic Diseases. 5. *Phlebitis*—inflammation of the veins of the wounded part, of which the operation is the exciting cause; this requires the wet-sheet pack, with wet cloths to the inflamed part. 6. *Fainting*—which results from the abstraction of a large quantity of blood, or from a less quantity suddenly withdrawn by making a large orifice; the treatment has been described under the head of Syncope.

Leeching and scarifying are among the common injuries which modern surgeons are fond of inflicting upon afflicted humanity. The usual morbid consequences are, inflammation of the skin and adjacent blood-vessels—*erythema* and *phlebitis*—dangerous *hemorrhages*, and unseemly *scars*. For all these "accidents," the coldest water is the best remedy.

Wounds of the throat, of which throat-cutting is the most prominent example, present many degrees of severity and danger, from a mere incision through the integument, to a division of the jugular veins, windpipe, and carotid arteries. The principal danger is from hemorrhage; and all the vessels which bleed freely, whether arteries or veins, must be taken up and tied; after which the lips of the wound are to be retained together with both sutures and adhesive straps.

Wounds of the scalp are liable to be followed by erysipelatous inflammation; the hair must be shorn, and the divided parts brought in proximity by adhesive straps, and sutures when necessary.

Wounds of the chest are apt to penetrate the substance of the lungs, in which case air and blood together will bubble out of the wound and the patient will manifest short breath and bloody expectoration

The wound should be covered with a plaster, and cooling derivative baths—half and hip—employed.

Dr. Hill, author of an excellent surgical work (*Eclectic Surgery*), makes the following pertinent remarks in relation to the bleeding practice in this case. "*Venesection* is recommended in the books 'to divert,' as they say, 'the blood from the lungs.' But surely it is as well to bleed to death through a wound in the chest as through one in the arm! We are told that the bleeding 'can hardly be carried too far; for if the patient be not relieved by this measure, *no other can possibly save him.*' (Gibson, vol. i., p. 19.) The reason given for bleeding, in such cases, is as absurd as the process itself."

Wounds of the abdomen are among the most dangerous. When the intestines are wounded, the patient is affected with nausea and vomiting, and the matters ejected or dejected will be bloody. When a portion of intestine protrudes, it must be replaced as soon as possible; if this is not done within forty-eight hours, adhesions may form and render it impossible. When the protruded bowel is distended with gases or fæces, by which its return is hindered, these may be pressed forward into a portion of intestine within the abdominal cavity; or, if this measure fails, the wound must be dilated. These wounds, when large, may require the suture; a fine needle and thread only should be used. For several days after severe injuries of the bowels or lungs, the patient should eat little or nothing, and the bowels be moved, when necessary, by warm injections.

Wounds of the joints are liable to be followed by severe inflammation, terminating in adhesions and *anchylosis*, or stiff-joint. The limb should be kept in the easiest possible position, perfect quiet observed, and cold-water dressings be assiduously applied. The modern disease, called in some late books *synovitis*, is a chronic inflammation of the synovial membrane, and to some extent of other structures of the joint, and is produced by some external injury. I have seen several cases affecting the knee-joint, produced, most unquestionably, by wearing strapped pantaloons. *Synovitis* is known by a sense of weakness or lameness in the affected joint, always increased by any considerable motion, and frequently amounting to pain when the exercise is prolonged. There is usually none, or but slight, external redness, swelling, or heat. This affection requires a long time to cure; the remedial plan consists of a very strict dietetic regimen, one or two general baths daily, with the constant application of local compresses, and occasional *shallow* foot-baths. When the knee-joint is the seat of the disease, the cold leg-bath should be employed for half an hour once or twice a day

CHAPTER IV

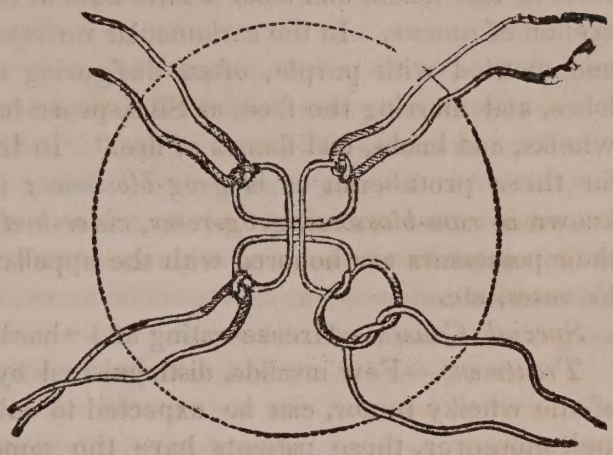
TUMORS.

EVERY tumor is a morbid swelling or a new formation—an increased or perverted development of organic substance. The common causes are injuries, as pressure, blows, bruises, etc., although it is seldom that we can trace any particular tumor to the particular accident from which it originated. They may also arise from capillary obstruction, and this is induced by many of the unhealthful eating, drinking, and anti-bathing habits of society. A mechanical injury of the vessels of a part, or a long-continued inflammation or obstruction, may produce a change in its nutritive function, by which an abnormal structure is developed; and when once this perverted action commences, it may progress to an indefinite period or extent. In their incipient stages they can frequently be removed by strong douches, cold compresses, and continued compression. Tumors are distinguished into *adipose*, *cellular*, *fibrous*, *cartilaginous*, *osseous*, *encysted*, *fungous*, *indurated*, *scrofulous*, *malignant*, *pulsating*, *vascular*, etc., according to the structure affected, and the form, character, and consistence of the swelling.

The older surgeons divided tumors into *sarcomatous* or *fleshy*—comprehending those which are composed of fatty, fibrous, medullary, fungous, or other substances softer than bone; *osseous* or *bony*; *osteo-sarcomatous*—when involving both the bony and fleshy structures; and *encysted*—containing a fatty or fluid substance within a globular cyst, as in the case of *wens* and *hydatids*.

Adipose tumors are collections of *fatty* matter inclosed in a cyst or sac of condensed cellular membrane, which renders them also *encysted* tumors. When filled with a suet-like matter, they are called *steatomous*; when containing a honey-like substance, *melicerous*; and when their contents are a pap-like fluid, *atheromatous* They are not painful, and only inconvenience the patient by their bulk, weight, or pressure. They are easily removed by making a T incision through the skin, and carefully dissecting around them to detach the cysts from the surrounding structures. They may be removed by the "eight-tailed ligature," fig. 197, two needles being drawn through the under side of the tumor, touching each other at right angles, and each carrying a double ligature; the loops are then cut, and the ends tied in four knots, by which the tumor is completely strangulated. These tumors do not reappear after having been entirely removed.

Fig. 197.



LIGATURE FOR TUMORS

Fibrous tumors are composed of capsules of greater or less density, inclosing yellow or whitish substances divided into lobes or septa by cellular substance; their shape is irregular, and they have a doughy consistence. They are not painful, and are easily removed by the ligature or knife, being almost always situated in accessible places. The fibrinous contents of these tumors adhere so loosely to their capsules that they can readily be removed by the finger or forceps on making an incision through the skin.

Cellular tumors are smooth, firm, and composed of compacted layers of areolar tissue, containing, in thin cells, albuminous, fibrinous, and sebaceous matter. They are never painful except when inflamed. The cutaneous veins involved in the tumors may become varicose, and when abrasion occurs, sloughing and fungous growths are apt to follow. Excision with the knife is the best treatment; but when sloughing takes place the mild caustic is necessary; and the strong caustic when fungous appearances present.

Vascular tumors are limited, in surgical technology, to those morbid developments of erectile tissue called *nævi materni*, or *aneurism by anastomosis;* and these may be *superficial* or *subcutaneous.* The proper plan of treatment contemplates the destruction of the morbid congeries of blood-vessels in such a manner as to avoid hemorrhage. Repeatedly puncturing the part with hot needles, and the repeated applications of caustic, a small part of the surface only being touched at once, with constant but moderate compression, have each succeeded in removing them.

The character of the other varieties is sufficiently indicated by their name, and the treatment will be given under the head of particular tumors.

WHELK—IONTHUS.—This affection is a stationary, tubercular, unsuppurative tumor, generally found upon the face. It comprises the varieties called *stone pock*, and *carbuncled face*, or *rosy drop—gutta*

rosea. Stone pock is a pimply eruption of hard, red tumors, which are sore to the touch, and ooze a little fluid at the tip, or a grub-like concretion of mucus. In the carbuncular variety the tumors are confluent, and mottled with purple, often disfiguring the nose with pendulous lobes, and marring the face, as Shakspeare has it, with "bubukles, and whelks, and knobs, and flames of fire." In Ireland, the common name for these protuberances is *grog-blossoms;* in this country they are known as *rum-blossoms, grog-roses, cider-buds, beer-berries,* etc., while their possessors are honored with the appellation of *copper-noses, bottle-noses,* etc.

Special Causes.—Grease-eating and "hard drinking."

Treatment.—Few invalids, distinguished by the carbuncular variety of the whelky tumor, can be expected to submit to *water*-treatment; and, moreover, these patients have the same reason to regard their "roses" and "blossoms" as badges of honorable distinction, that the Englishman has his gouty toes and stomach, or the Polynesian Islander his enormously misshapen leg. All alike can boast of "*high living.*" But if we *should* be called upon to indicate a remedy, we might with all propriety suggest the details of a "sober and temperate life."

Sycosis.—This term has been applied to a fig-shaped tumor, a fungous ulcer, and a horny excrescence about the eyelids; but usually and here it is employed to denote an eruption of inflamed tubercles on the scalp, and on the bearded portion of the face. These tumors often ulcerate and discharge an ichorous or glutinous matter. They are connected with uncleanliness in either the positive or negative sense—*bad* diet or drink, or the *absence* of water, and may be cured by thorough local and general bathing.

Warts—Verrucæ.—These are rather excrescences than tumors; some are smooth and apparently filled with fatty matter; others, called *seed-warts,* are rough, hard, and insensible. Some warts secrete a fluid which is infectious, and will produce a crop on other persons or on other parts of the same person. They may be effectually removed by caustics—potassa, nitrate of silver, nitric acid, or nitro-muriatic acid. The latter preparation is the best; it may be applied by means of a pointed piece of wood to the centre, taking care not to let the acid come in contact with the surrounding structure. To prevent this, a piece of perforated adhesive or court-plaster may be placed around the wart. The acid may be repeated until the troublesome and unsightly excrescence is entirely destroyed, which will usually require but a few days.

Corns --Clavi.—These well-known toe-tormentors are produced by tight shoes or boots. The first principle of cure is to give the feet a respectable area of freedom; and the second is to soak them in warm water, and shave off the horny substance, and then touch them with the nitric or nitro-muriatic acid. When the corn is inflamed or highly irritable, the tepid foot-bath should be employed to remove this condition before the acid is applied. The *aqua regia*—nitro-muriatic acid—is the ordinary secret remedy of the "corn-curers." When the corn is fully formed, or ripe, a membrane separates it from the true skin, so that it can be taken off without injuring that surface; and this circumstance enables professional *chiropodists* to elevate the "grain" on the point of a pen-knife, after an application of the acid.

Bunion.—This affection, though generally regarded as a variety of corn, is really an inflammation and swelling of the bursa mucosa, at the inside of the ball of the great toe; it often produces a distortion of the metatarsal joint of the great toe, and is produced by the same causes as corns. The treatment is, warm foot-baths, when the part is very tender and irritable; at other times, frequent cold-baths; and when a horny substance resembling a corn appears externally, the application of caustic. I have known bad corns and bunions cease to be troublesome after the patient had been a few months under hydropathic treatment for other complaints.

Onyxis.—This distressing affection, sometimes known by the distressing synonym of *onychogryphosis*, consists in an incurvation of the toe nail from a bruise or the pressure of a tight shoe, producing inflammation and ulceration, and followed eventually by fungous growths, or proud flesh, which is exceedingly tender and painful. The cure is slow but certain. The foot must be frequently soaked in warm water until the soreness is so far abated that it can be handled without pain; then with a probe press pledgets of lint as firmly as can be borne under the most detached point of the toe nail, pressing them also between the nail and projecting portions of the flesh as far as possible. Cover these with the wet compress, and apply a moderately-tight bandage over the whole, frequently wetting the whole with warm, tepid, or cool water, as either temperature is most agreeable. The tents are to be pressed further and further under the nail from time to time, and the foot should be soaked and dressed once or twice daily. When portions of the nail become free they may be cut off, and mild caustics may be employed to remove fungous or indurated growths, which do not yield to the other measures of treatment.

GANGLIONS.—These are encysted tumors, formed of a viscid, albuminous fluid, resembling the white of an egg, and varying in size from a pea to that of an egg. They are hard, globular, and without discoloration of the skin. Sometimes the cyst is loose, but in most cases it communicates by a narrow foot-stalk, with the sheath of a tendon, or the synovial capsule of a neighboring articulation. Ganglions are always situated in the course of a tendon, and usually appear on the wrist, hand, and top of the foot. In their treatment surgeons have resorted to compression, percussion, discutient applications, extirpation, and caustics. When the tumor is prominent and round, a simple incision will allow its contents to escape, and if dressed with a moderately tight compress, the wound will heal readily. I have *always* removed them in this way, and *never* knew any injurious consequences to result from the operation. Oblong and diffused ganglions may be punctured with a lancet or couching needle, and the fluid pressed out. When the cyst is thin it may be ruptured by a blow or by pressing it firmly against the bone—in which event the fluid will be absorbed and a cure result; but whether the sac can be ruptured with a safe degree of violence, can only be known by trial. Irritants or caustics, to excite suppuration, is a method recommended by some authors; it is applicable to cases attended with ulceration or induration.

RANULA.—This is a small tumor under the tongue, resulting from obstruction of some one or more of the excretory ducts of the submaxillary or sublingual glands. It may be cured by clipping off a small portion with a pair of sharp scissors; and, if it does not disappear in a few days, touch it with nitrate of silver or sesqui-carbonate of potash.

EPULIS.—A small tubercle of the gums, which generally appears above or below the incisor teeth, sometimes becomes a serious malady. It commences with a small seed-like swelling, which grows so slowly and painlessly as to attract little notice; but at length it enlarges rapidly, becomes soft, bleeds on the slightest touch, fungous formations spread out, involving the gums displacing the teeth, and affecting the glands of the mouth and other soft parts, until the patient is destroyed by hemorrhage or worn out with irritation. The best surgeons recommend the removal of the tumor as soon as its character is ascertained. The adjoining teeth must be first extracted. Sir Astley Cooper prefers the knife; but the cauterizing process as recommended by Dr. Hill is, I think, far preferable; it consists in destroying the tumor to its base, with every portion of the diseased structure, by means of

caustic potash, applied until disorganization and sloughing take place—the surrounding parts, lips, tongue, etc., being protected by cotton wet in vinegar, rolled up and pressed in around the portion to be cauterized.

In all cases of malignant tumors and ulcers, let me here say once for all, a rigidly abstemious and exclusively vegetable diet is one of the most important, and frequently one of the indispensable measures of the remedial course.

Bronchocele.—This tumor, commonly called *goitre*, or *swelled neck*, is a preternatural enlargement or hypertrophy of the thyroid gland. In its early stage it is soft and elastic; but as it advances in size it becomes firmer, and spreads toward the sides of the neck, attaining sometimes a prodigious magnitude. In the valleys of Switzerland, Savoy, the Tyrol, Derbyshire, and some other places, it is very prevalent; most frequently, however, affecting young females. It is found in all parts of the United States, but more commonly in low, moist, marshy, or malarious situations. In this country the disease seldom increases to a dangerous extent, the deformity being the principal source of uneasiness.

To treat this complaint successfully we must employ as powerful douches to the spine and to the tumor itself as the patient can conveniently bear, with occasional packings in the wet-sheet, and a thorough course of derivative half, hip and foot-baths; and to this course of bathing must be added a plain, abstemious, and rather dry diet. The drop-bath for half an hour or longer, followed by the wet compress, is among the promising remedial resources; and if there is the least tendency to constipation, tepid injections should be freely employed.

It is but a few years since *iodine* was the vaunted specific for this disease throughout the medical world; but it was found at length that a great many more constitutions were killed than bronchoceles were cured by the remedy; hence, like every other specific which ever has or ever will be got up on drug-medication principles, its destiny is—oblivion.

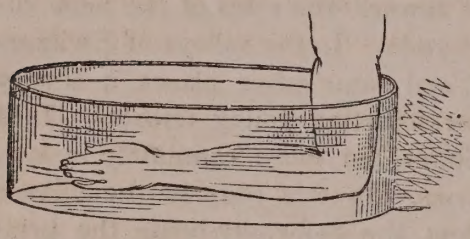
Paronychia—Whitlow—Felon.—An acutely painful inflammation, seated about the nails and ends of the fingers, has been called by these terms indiscriminately; the term paronychia is applied to all phlegmonous tumors of the fingers and toes. In some cases the inflammation commences in the periosteum, and effusion takes place between it and the bone, constituting the worst or malignant form—the *true felon;* in the *tendinous whitlow* the inflammation commences in the sheath of a tendon; and in a variety called *cutaneous*, the effusion

occurs in the subcutaneous areolar tissue, or between the skin and epidermis. Similar inflammations are sometimes found about the palms of the hands and soles of the feet.

The severe and lancinating pain of paronychial tumors arises from the firmness and inelasticity of the skin and other structures where it is seated, which act upon the inflamed vessels like a tight bandage, producing a most distressing sense of pressure; and hence it is that when the skin opens the soft parts below are pushed out like a fungus, and become exquisitely tender.

Treatment.—On its first appearance this affection may generally be promptly cured by immersing the whole arm in very cold water. The arm-bath, fig. 198, should be frequent and prolonged. When discoloration of the skin indicates approaching suppuration, tepid, or even warm water to the inflamed part, with the cold elbow-bath, will prove the most soothing treatment. In the *felonious* variety it will save the patient much time and suffering to cut with a scalpel down upon the bone, making a free incision one or two inches in length.

Fig. 198.



ARM-BATH IN WHITLOW.

Scirrhus and Cancer.—I have already treated of cancers medically, but as many surgeons regard scirrhus and cancerous tumors as distinct diseases, while others treat of scirrhus as though it were the first stage or beginning of a cancer, it may be proper to consider both subjects connectedly in this place.

It is unquestionably true that all cancers are in their incipient stage *hard, scirrhous, indurated* tumors—*occult cancers*—and in their latter stage, *open ulcers—carcinoma.* But it is equally true that indurated or scirrhus tumors often remain for an indefinite period in a condition of cartilaginous and almost stony hardness, without evincing any tendency to cancerous ulceration; and not unfrequently, when irritated or injured, degenerating into other malignant tumors, very different from true cancer. A scirrhus tumor, therefore, is not *per se* the proof of an approaching cancer. Indeed, some authors have grouped together *scirrhus, medullary sarcoma, fungus hæmatodes,* and *carcinoma,* as constituting *species* of the generic family of *cancer.* But it is enough for practical purposes, to know that a scirrhus tumor *may* become a cancer or some other malignant ulcer; and when the surface of the scirrhus is uneven to the touch, the skin leaden and wrinkled, with ir-

regularly dilated veins, and twinging, gnawing, or lancinating pains, the cancerous character is clear.

Diagnosis.—Non-canceroid scirrhus, and all hardened but non-malignant tumors, are never preceded by nor attended with pain of the gnawing or lancinating kind. They present, also, a smooth and more rounded surface, with a manifest swelling *in* instead of *out* of the part in which they are found; whereas, in canceroid scirrhus, the part affected is condensed and really diminished in bulk.

Treatment.—Scirrhus or hardened tumors resulting from inflammation may be dispersed by the plan of treatment recommended for bronchocele. But the canceroid tumor, in its early stage, may, perhaps, be treated with equal success by the knife or caustic; and in either case care must be taken to remove or destroy every vestige of discolored skin or affected flesh.

Open cancers can be and frequently are cured by a free application of caustic potash, although the operation is a painful one. Dr. Hill advises, in the *scirrhus stage*, the application of a pencil of potassa, so as to surround completely as well as to open the cancerous mass, letting it penetrate into the very center from several different points; and if the patient cannot bear so extensive an application at once, the caustic may be applied to different parts from day to day. Between the cauterizations the sore is to be covered with a poultice of slippery elm flour. In the open cancer the caustic potash is to be applied freely to the whole of the ulcerated surface; burning to the bottom of the tumor by striking the pencil in from different directions. When the eschar sloughs off, any remaining portion of the morbid growth should be touched with the caustic; and these applications are to be continued and repeated until all of the morbid structure is destroyed. During the healing process the sore is to be washed daily with the mild caustic—sesqui-carbonate of potash—to destroy the vitality of any remnant of cancerous virus that may exist, and prevent the development of new. The constant application also of flour, starch, or slippery elm, absorbs the pus, and thus prevents its corrosive effect. When this or any other operation is resolved upon, the body must be prepared by a thorough course of hydropathic bathing and dieting.

Fungus Hæmatodes.—This term means *bloody fungus;* the disease is sometimes called *medullary sarcoma*, *spongoid inflammation*, *encephaloid tumor*, and *soft cancer*. It commences with a small, elastic, movable, and nearly insensible tumor, *under* the skin, the integument itself being unaffected. Sooner or later it becomes inflammatory, swells rapidly, the skin becomes discolored with purplish or red spots

and adheres firmly to the distended and lobulated mass. Ulceration soon comes on; dark-colored fungous growths sprout out irregularly and at several points beyond the surface; the whole mass becomes exceedingly vascular, the top being much larger than the base; eventually the adjacent glands are affected, when the patient's general health rapidly declines.

Treatment.—When the lymphatic glands have become affected, the disease may be pronounced incurable. In its early stage, while the tumor is loose underneath the skin, and nearly free from active inflammation and tenderness on pressure, it may be destroyed by caustic or removed with the knife. The knife is preferable when the diseased mass is so situated that the whole can be removed at once. The excision should include every particle of morbid structure; and to make sure of this the dissection should extend some distance beyond all appearance of disease. When cauterization is resorted to it must be managed, as in the case of common cancer, except that it is more important to destroy, if possible, every vestige of the diseased mass by the first application.

Bone Cancer—Osteo-Sarcoma.—This disease, called *spina ventosa* by some authors, consists in the deposition of a flesh-like matter in the structure of the bone, producing a morbid enlargement. As the disease progresses, the internal structure is changed to a brownish, fleshy mass. When the swelling opens on the surface, large quantities of pus, of a more or less icherous or sanious character, are discharged. The affection is most frequently seen in the lower jaw bone. The early symptoms are, acute pain, followed by a hard elastic swelling, after which the pain becomes more dull, and eventutually lancinating.

Treatment.—The first thing to do—except when a part or limb is so far destroyed as to require amputation or forbid any attempt to cure—is to cauterize an opening into the center of the diseased mass, so as to allow the free escape of purulent matter and loose pieces of bone; the limb or part is then to be kept well covered with wet compresses, and, when practicable, the cold stream or pouring-bath should be frequently applied; the cavity should be washed out once or twice a day with tepid water; and, if there are fungous growths appearing, a solution of the mild caustic should be applied daily, filling the cavity, after each application, with pledgets of lint.

Carbuncle—Anthrax.—This affection is sometimes called a malignant boil. It commences with a livid, red swelling, attended with a

burning, smarting pain, followed by vesication; the ulceration appears in the form of several fistulous openings, from which a thin, acrid fluid exudes, excoriating the adjacent surface. The disease always indicates a very depraved or debilitated state of constitution, and rarely occurs in any but aged persons. It is generally located in some part of the back or on some portion of the head.

Treatment.—The best management in the most malignant forms is, without doubt, the cauterization plan recommended for the preceding disease. There is much less pain attending the application of caustic in carbuncular than in cancerous or malignant fungous tumors. But the less virulent cases, wherein the fetor is moderate and the gangrenous tendency slight, may be cured by thorough packing, a rigid diet, and wet compresses.

Lupus—Noli-me-Tangere.—Lupus literally means "the wolf;" and noli-me-tangere, "don't touch me"—terms expressive of the rapacity and abhorrent nature of this excrescence. It is a malignant disease, usually about the nose and mouth, commencing as a small tumor, and progressing to a foul ulcer. Its first appearances are various, as a small dark sore, tubercle or vesicle, or a large, prominent wart. The lupus ulcer is known by a purple margin and depressed center, which exudes a tenacious pus, or an icherous matter; the exposed surface has a fiery red appearance, and the pain is of a pricking or smarting kind. When occurring near the eye, it will, if not arrested, destroy that organ, and may extend to the brain. The general health is not usually much affected.

Treatment.—In the early stage, when the disease appears in the shape of warty excrescences or tubercles, the knife or caustic may be employed indiscriminately. When it commences as a superficial, red, angry sore, the mild caustic will be sufficient. When it has extended over a large surface, or penetrated deeply, the strong caustic must be freely applied.

Aneurism.—An aneurismal tumor, in its strictest sense, is a preternatural dilatation of the coats of an artery, forming a pulsating swelling, which eventually ruptures and destroys the patient by hemorrhage. The term is also applied to enlargements of the cavities of the heart. In the *true aneurism* the coats of the artery form the pouch or sac of the tumor; when the sac or covering is formed of effused lymph, into which the blood has escaped from the artery, it is called *false aneurism;* sometimes the blood is poured into the cellular membrane, constituting the *diffused aneurism;* and when the effused blood, in conse-

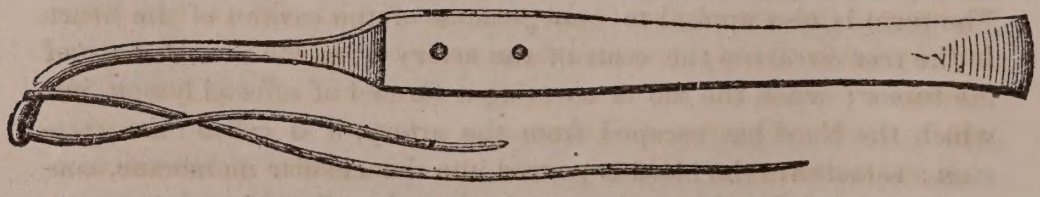
sence of a rupture of the internal and middle coats of an artery, makes itself a channel between these and the outer coat, it is called *dissecting aneurism*. *Aneurismal varix—varicose aneurism*—is a dilatation of a vein in consequence of a gush of blood from a neighboring artery, and is generally produced by venesection." *Nævus* is a dilatation of the small arteries, producing a red, shining spot on the skin; when these vessels are larger, the affection is called *aneurism by anastomosis*.

Diagnosis.—Aneurism, when *external*, is known by a pulsating tumor, which beats synchronous with the artery where it occurs; it may be diminished or emptied of its contents by pressing on the affected artery above the tumor. *Internal* aneurisms, which occur in the heart or large vessels of the chest and abdomen, are extremely difficult to distinguish. Aneurisms of the heart are divided into *active* and *passive;* the former is really a *hypertrophy* or thickening of the parietes of the organ, by which its cavities are *diminished;* the latter is the true *cardiac aneurism*, attended with an enlargement of its cavities. The symptoms in all these cases are exceedingly obscure and variable, and are common to nervous and dyspeptic invalids, as well as the result of various tumors and visceral enlargements not connected with any structural lesions of the circulating system. The most prominent, however, are, a strong and constant beating or pulsatory motion above or below the sternum, *when the bowels are not constipated;* a dull, heaving, beating, or boring sensation about the spine; and a double beating, or some other uniformly irregular character of the pulse at the wrist.

Special Causes.—Injuries, blows, falls, violent exertions, mental excitements, and above all, obstructing, concentrated, and greasy food, which thickens the blood and increases the labor of the heart and arteries in propelling it.

Treatment.—In the early stage of aneurismal tumors, compression, when it can be managed by an experienced operator, is the best remedial resource. In other states and circumstances, the ligature is necessary The most approved operation is that of tying the artery with a single ligature above the tumor. After dissecting down to the vessel affected, the blunt end of an aneurism needle, fig. 199, should be work-

Fig. 199.



ARMED NEEDLE FOR LIGATING AN ANEURISMAL ARTERY.

ed around the vessel to separate it from its accompanying vein or nerve this may be done by pushing rather than cutting, to avoid wounding the the nerve or vein. The ligature is improper in false aneurisms of large extent, after the pulsation has ceased in the tumor, and when caries or gangrene exists in the vicinity of the disease. After the obliteration of the cavity of the diseased vessel, the anastomosing vessels in its vicinity will enlarge to maintain the necessary circulation.

In varicose aneurism the vessel must be tied both above and below the injury; this double ligation is necessary also in localities where there are numerous anastomosing branches, as on the dorsal surface of the hand and foot.

The constitutional treatment is of first importance in all cases of organic diseases of the blood-vessels.

The diet must be simple, bland, and opening; all violent exercises of body or mind strictly avoided, and all bathing appliances must be mild and gentle, so as to prevent any shock to the circulation.

VARIX.—*Varices* or *varicose veins* are tortuous, knotty, elongated thickenings and dilatations of the coats of these vessels. Varicose enlargements are most frequently found in the lower extremities, the great saphenal vein and its branches being the affected vessels; the spermatic and hemorrhoidal veins are also very liable to become varicose. In many cases the valves of the veins are destroyed; the affected vessels are liable to inflammation; and the lower limb is particularly disposed to ulceration, which bleeds easily and heals with great difficulty. Varicose ulcers have existed twenty and thirty years, rendering the limb almost useless.

Treatment.—Compression with the common bandage or roller, when skillfully managed, will often cure varices of the lower extremities. Surgeons have experimented largely in several processes—cirsotomy or incision, extirpation, ligation, and cauterization—but with very poor success in all. A plan for obliterating the vessels by the combined action of caustic and compression has been successful in many cases. It consists in the application of caustic to one or two very small portions of the distended veins at a time, so as to produce ulceration and ultimate adhesion, the part being, meanwhile, dressed with adhesive plaster or the *wet* roller. As soon as one dilatation or knob is obliterated, the caustic may be applied to another, and so on. I regard this practice as perfectly safe provided due attention is paid to bathing and dieting.

WHITE SWELLING—HYDRARTHRUS.—This formidable disease com

monly affects the knee-joint. Authors make two varieties, *scrofulous* and *rheumatic*, as it appears in persons predisposed to, or afflicted with, either of those complaints.

Symptoms.—The swelling comes on very slowly, and is attended with little pain at first. Gradually the pain increases till it becomes intense, especially at night. The skin appears whiter than natural, becomes tense, shining, and marked with varicose veins, and there is a constant sensation of heat in the part. In this condition it may remain for years, but usually the swelling continues to increase until the soft parts become so hard as to appear like enlarged bone. As it progresses the tibia is thrown backward, the condyles of the femur project forward, the whole limb emaciates, anchylosis takes place while the joint is flexed, and matter collects, and is discharged at various sinuous openings. Extensive caries of the bone often ensues, with hectic fever, soon terminating in death.

Special Causes.—Repelled eruptions, local injury mercurial and antimonial medicines, syphilitic taint.

Treatment.—This is one of the maladies which the popular "healing art" does not pretend to heal. When the joint is very painful, it should be bathed in warm water or fomented until this is relieved, and then dressed with several folds of wet cloth, except when the inflammation is acute, in which event cold applications are most appropriate, the rule being, as in all similar cases, to regard the sensation of the affected part. The cold pouring-bath, douche, or leg-bath, or even moderate congelation, may be employed with advantage when the sensibility of the part is such that they can be administered without pain. Indeed, in most cases they will each and all have a soothing and sedative influence. Callous edges of the ulcerated surfaces, sinuses, and fungous growths, will require the application of the mild or strong caustic. The limb should be kept as extended as possible, and as much compression employed during the suppurative stage as can be borne without pain. To these local measures must be added thorough constitutional treatment, in which the packing-sheet should be the leading process. The regimen must be such as has been heretofore recommended for scrofula.

Hydrops Articuli.—This is usually regarded as a result of rheumatic disease, and hence called *rheumatic white swelling*. It consists in a distention of the synovial membrane and capsular ligament by serous effusion, which renders the limb lame and stiff, though not very painful except from exercise. Sometimes the effusion extends along the tendons of the muscles. The warm or cold douche, wet bandages

the pack-sheet, copious water-drinking, and frequent injections to keep the bowels entirely free, are the remedial measures.

VARICOCELE—CIRCOCELE—SPERMATOCELE.—A varicose dilatation of the veins of the scrotum and spermatic cord, is called indiscriminately by these terms. When the spermatic veins are affected, the tumor is soft, knotty, doughy, unequal, and compressible, increasing from below upward. The disease requires no special attention, save a careful regard to hygienic habits; occasional sitz-baths, or the ascending douche, with the use of a suspensory bandage.

HÆMATOCELE.—This is an extravasation of blood in the tunica vaginalis, or an effusion into the cellular membrane of the scrotum. The external parts are often thick and dark, somewhat resembling gangrene. The treatment is the same as for the preceding affection. Sometimes the disease is produced by the wounding of some large vessel, in which case the scrotum may be laid open and the vessel tied.

SARCOCELE.—This term is variously applied to a scirrhus or cancerous, encysted, or fibrous tumor of the testis, and to a simple enlargement as a consequence of maltreated chronic inflammation. When the tumor is malignant, castration is the only sure remedy; otherwise it may be reduced by the remedies recommended for the preceding maladies.

HERNIA HUMORALIS.—This technic is applied to a swelled testicle from common inflammation, or to a hardened tumor which is at first confined to the epididymis, the pain extending along the cord to the loins. The latter variety is frequently the result of a suddenly-suppressed gonorrhœal discharge. The former variety requires *cold*, and the latter *warm* water-treatment at first, to be followed by cool, and finally cold applications.

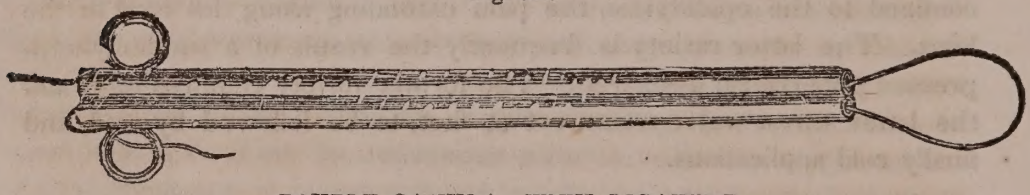
CYSTIC SARCOMA.—This is a hydatid disease of the testis. It occurs chiefly in middle life, and is sometimes mistaken for hydrocele; but the *oval* shape of the tumor will readily distinguish it from that affection which is *pyriform*. The morbid mass consists in part of a solid structure, and partly of cysts of various sizes, containing a thin, transparent, yellow serum, or a turbid fluid. The complaint had better be managed on the "let alone" system, unless its bulk or malignancy creates great inconvenience or suffering, in which case extirpation is the only remedy.

Polypi.—The most common situations for polypus tumors are the nose and vagina, although they may grow from any introverted mucous surface. For all practical purposes, it is sufficient to distinguish them into *soft* and *hard*, although surgical writers have made several subdivisions of each, as mucous, vesicular, fibrous, fleshy, scirrhus, or cancerous, etc. The latter variety is probably a true cancer, instead of a cancerous polypus.

Treatment.—In addition to what has been heretofore said in relation to the treatment of these morbid growths, it may be remarked, that the application of powdered caustic—either mild or strong, according to the firmness of the tumor—will frequently be sufficient to destroy them In many cases the caustic may be advantageously combined with mechanical force, as squeezing, twisting, crushing, etc., tearing away such parts as may be conveniently detached. The powder should be applied with a camel's-hair pencil. This plan is particularly adapted to nasal polypi. The practitioner should also bear in mind that nasal polypi are very liable to grow again, after having been removed by mechanical means, unless the surface from which they are detached is thoroughly cauterized.

Polypi in the vagina, whether originating from its sides or from the mucous surface of the uterus, usually present a pedunculated shape, which is favorable to the operation of removal by ligature. I have known cases connected with such a degree of prolapsus as to allow the application of a ligature without any instrumental assistance; but generally the ligature will have to be introduced by means of the polypus forceps, or the *double canula*, fig. 200, after which it is to be drawn

Fig. 200.



DOUBLE CANULA, WITH LIGATURE.

tight enough to cut off the circulation and strangulate the tumor; the canula is to remain, and the ligature tightened from time to time, until the tumor comes away, which will usually be in five or six days. When the neck of the polypus cannot be reached by ligature, the tumor may be destroyed by a solution of the caustic potash, introduced through a silver catheter; or the powdered caustic may be applied by means of pieces of fine sponge, with threads attached to withdraw them

Nodes.—A majority of bone tumors are included under the term *exostosis*, and the term *node* is usually restricted to hard concretions or incrustations which form around rheumatic and gouty joints. It is employed, however, by several writers, synonymously with exostosis; and many authors apply it to tumors of the cylindrical bones resulting from the venereal taint. It is the opinion of some surgical authors that syphilitic nodes only occur in persons who have taken mercury, which, by the way, has inflicted vastly more mischief on the human constitution than has the disease it is intended to cure.

Samuel Cooper says (*Cooper's Surgery*), "I believe that true nodes are rarely produced in syphilis, unless the patient has been using mercury." Dr. Hennen, who had an extensive experience in the treatment of syphilitic diseases, affirmed that he had never seen but two cases of nodes in patients who had not taken mercury; and in relation to those two cases the question may be fairly raised, Whether the patients had not taken mercury on some previous occasion.

Treatment.—This is mainly constitutional. Thorough general bathing, an abstemious diet, and local compresses, are the leading measures. When the tumor becomes projecting and pointed, the soft parts may be laid open, and the tumor removed with a saw, chisel, or trephine; when ulceration occurs, attended with callous edges or fungous excrescences, these require cauterization.

Enlargement of the Prostate Gland.—In this affection the gland often attains many times its ordinary size, and is much harder than natural. It produces but slight difficulty in urination, yet it prevents the bladder from being completely evacuated, and the urine is, in consequence, rendered constantly turbid. Total retention of urine, however, is liable to occur if the swelling is aggravated by any excesses to which the patient is addicted. There is a sense of weight in the perineum, and the middle lobe of the gland usually projects into the bladder, altering the shape and direction of the urethra, and rendering the passage of a catheter or sound more or less difficult. The disease is usually caused by calculous concretions or venereal affections.

Treatment.—Frequent hip-baths, and a thorough employment of the ascending douche are the ordinary local appliances; to which must be added some general daily bath, as the dripping-sheet, or pack and half-bath. When it is produced by repelling or suddenly drying up a gonorrheal discharge, warm hip and foot-baths must be assiduously employed until the discharge reappears or the irritation subsides; after which the cold treatment may be employed as above.

CHAPTER V

ULCERS.

ULCERS are purulent solutions of the continuity of the animal texture. In a general sense, they are distinguished into the *benign*, or *healthy*, and the *malignant*, the *indolent*, and the *irritable*, etc. They are also subdivided into many varieties, according to their causes, nature, tendencies, consequences, etc., as *simple*, *sinuous*, *fistulous*, *fungous*, *gangrenous*, *cancerous*, *scorbutic*, *syphilitic*, *scrofulous*, *inveterate phagedenic*, *virulent*, *sordid*, *cacöethic*, *carious*, *varicose*, etc. Many tumors, if not arrested in their early stage, become ulcers, as cancer carbuncle, etc.

An ulcer is called *healthy* when its purulent matter is a normal secretion, unattended with the destruction of the surrounding parts. Its surface is florid; its granulations are small and of uniform size; it is without offensive smell; and it heals regularly, leaving little or no scar. A common boil is an example.

An *irritable ulcer* is very tender to the touch; extremely liable to bleed; its discharge is slight, and of a thin, ichorous, or sanious appearance; its color is dark or purplish; its granulations are imperfect and spongy; its edges are ragged and everted; the parts around are red, swollen, and often œdematous.

The *indolent ulcer* is the more frequent form of "running sore" we meet with; its edges are inverted, rounded, thick, glossy, and regular; the granulations are of a dull pale aspect, and insensible; the pus is thick, of a dark yellow color, and adheres to the bottom of the ulcer. It is most frequently located on the lower extremities.

Varicose ulcers may be either irritable or indolent; they are connected with enlargements or varices of the adjacent veins. They are generally situate below the knee.

Fistulous ulcers are sinuous cavities, having a narrow outlet, the disease being kept up by an altered texture of the part.

Specific ulcers result from the inflammation of specific diseases, as scrofula, salivation, syphilis, etc. Other distinctions, depending on mere varying appearances, or on common causes and terminations, are of no practical importance.

GENERAL TREATMENT OF ULCERS.—The constitutional treatment

is always of primary importance in chronic ulcerations of every kind In all matters of regimen the patient must be held to a strict accountability to physiological law. The whole skin must have, at least, one thorough daily ablution or packing. The local medication will vary according to the character of the ulcer. The *healthy* ulcer needs nothing more than a cool wet cloth. When the *irritable* ulcer is very painful, the limb or surrounding part may be fomented with warm cloths until it becomes easy, and then "done up" with the ordinary "water-dressing." When exposure to the air aggravates the pain, the surface may be covered with flour. The *indolent* ulcer often requires the application of the mild caustic to remove fungous growths or callous edges. When the surrounding parts are hard, they should be occasionally fomented; and if the sore is on the lower extremity, compression with the roller or by adhesive straps is useful. *Varicose* ulcers require still stronger compression; the roller bandage should be applied to the whole limb, and the sore treated in other respects according to its character. When the veins are extremely distended and knotty, adhesive straps may be advantageously applied over and adjacent to the ulcer; and these may be covered by the roller. Cauterization of each distended vein with potassa fusa, one or two inches distant from the ulcer, so as to obliterate their cavities by adhesive inflammation, may be resorted to in bad cases with safety, and usually with success. *Fistulous* ulcers generally require to be opened with the ligature, or obliterated by caustic.

Furunculus.—A boil, or *bile*, as some authorities have it, is a small phlegmon, seated in the dermoid texture, and tending to a pointed tumor which sooner or later breaks and discharges a white or yellowish pus, mixed with blood. Sometimes a small fibrous mass of dead but undissolved areolar tissue appears, after it suppurates, called the *core*. The only medication demanded is the wet dressing; and, should the tumor not open spontaneously when matter has evidently formed, it should be punctured with a lancet and the matter pressed out.

Parulis.—The common gum-boil is a small abscess which frequently forms in the gums. It is sometimes owing to carious teeth, but is generally produced by bad dietetic habits. Those who eat *coarse* vegetable food, and use the tooth-brush daily, are seldom troubled with such affections.

Fever Sores.—The most common form of chronic ulcers are known as "*fever sores*," "*brandy sores*," "*whisky sores*," etc., and some-

times, in view of their usual locality, "*old sore legs.*" They are generally connected with and the penalty of intemperate habits. I have known several bad cases among the children of liquor-drinking parents. The ulcers are deep, the limb is swollen, in some cases nearly as hard as bone, and frequently purple or dark. The character of the sore may be irritable, or indolent, or of a mixed character, some portions being irritable and others indolent.

Treatment.—These cases require a long course of treatment, but can generally be cured, provided the patient will sign and then *keep* the temperance pledge. When painful, they are to be soothed with warm water or the warm fomentation; when hot and inflammatory, the cold douche should be applied to the whole limb daily. Callous or fungous excrescences are to be destroyed by caustic. The roller bandage is also an indispensable part of the treatment. It must be applied twice a day—every morning and evening is a good rule—and thoroughly wetted with *cold* water *after* it is applied; wet cloths should always be placed over the bandage when there is the least preternatural heat or active inflammatory excitement. All these measures, however, will fail, unless the whole surface is thoroughly attended to in the way of bathing; and the stomach and bowels are kept unburdened and well cleansed by the appropriate quantity and quality of food.

It is a prevailing opinion among drug-physicians, and a popular prejudice with the people, that it is dangerous to cure old sores. Truth, "they say," lies between two extremes. The truth in this case, as in all others, is at one extremity. It is *always* dangerous to heal them drug-opathically, but *never* dangerous to cure hydropathically.

Caries and Necrosis.—These terms are often employed synonymously; but in strict surgical parlance, *caries* is an *ulceration* of the bony structure, analogous to *gangrene* of the soft parts; while *necrosis* is the *death* of the bone, analogous to *mortification*. Caries usually attacks the spongy bones, as the vertebræ; and necrosis as generally affects the long or flat bones, as the tibia, humerus, and bones of the cranium. Necrosis in the leg or arm is generally called "fever sore." The process by which dead portions of bone separate from the living—analogous to sloughing of the soft parts—is called *exfoliation*.

Symptoms.—The bones, though insensible in their healthy state, become exceedingly painful when diseased. The swelling has no regular apex or point, but is more distressing than ordinary inflammatory swellings, especially at night. The part is hot, somewhat livid, and sometimes comes on suddenly and progresses rapidly to suppuration.

The pus is dark, sanious, and fœtid, and generally discharged through several fistulous openings or pipes; and through these the rough, uneven surface of the bone can be felt by means of the finger or common probe. Sometimes the bones of the cranium are perforated at numerous points, constituting the *worm-eaten caries* of authors. There is more or less fever, which is of the hectic character. When necrosis occurs in the center or shaft of the long bones, it seldom or never extends to their articular extremities; but the exterior layers form a canal around the dead portion, which is called *sequestrum;* and between these swollen layers and the sequestrum suppuration takes place.

Special Causes.—Professor Parker disposes of the causes of necrosis in the following summary manner: "So far as any thing *can be known*, it seems to be the result of sudden changes of temperature." But the *fact* that both caries and necrosis frequently follow local injuries, as blows and falls, and are also frequently connected with constitutional taints, as scrofula, scurvy, syphilis, mercurialization, etc., seems to indicate that something *should* be known beyond mere temperature. The greatest number, as well as the most malignant kinds of caries and necrosis owe their existence to the *combined* action of mercury and syphilis, or mercury and scrofula; or, in the language of Samuel Cooper, "to the prejudicial influence of a badly conducted course of mercury."

Treatment.—In its forming stage the disease can generally be "discussed" by douching the part frequently with cold water, the constant application of wet cloths, and one or two packs daily. The late Professor Nathan Smith recommended making a free incision down upon the bone, and even into its substance, if relief from pain did not follow the first incision, on the plan of treating a felon or whitlow; and no doubt such a practice in a *very early* stage, would lessen the extent of the inflammation: still if the cold-water measures are vigorously employed it will be unnecessary. After ulceration has taken place, "the books" furnish us with any number of vinegar-and-meal, carrot-and-onion, bread-and-milk, soap-and-molasses, rum-and-sugar, scraped-potato, tobacco, strammonium, etc., poultices, to help "digest" the affair; but I know of nothing in theory or in experience which gives them any advantage over a few folds of old linen rags well wetted in pure soft water, provided the temperature is duly regulated.

But when the disease proceeds to suppuration and exfoliation, it is important to get rid of the purulent matter and dead bone as fast as possible, yet all rough handling of the diseased part must be avoided. If any portion of bone becomes loose or projecting, or can be ascertained to be dead—in which case its color will be *whiter* or *darker* than

natural—the caustic should be applied to it. "The mild caustic," says Dr. Hill, "has a peculiar effect on diseased bone, and seems to exert a stronger influence than the bi-carbonate, or even the pure alkali—caustic potash—without any injury to healthy parts." When there are several openings they should be converted into a single ulcer if possible; for which purpose the caustic, knife, or ligature may be employed according to circumstances. Dead bone and fungous growths may be dissolved by passing tents, charged with the sesqui-carbonate of potash, into the sinuses, and pushing them against the morbid structure. Sometimes new bone is formed around the dead part, inclosing it in a shell, and producing a preternatural enlargement of the part; an opening, however, is usually left in the new formation, through which purulent matter issues. This opening must be enlarged by caustic sufficiently to allow of armed tents or caustic solutions to be passed through a tube or syringe to the dead bone, to effect its dissolution. After every vestige of disorganized matter has been removed from the ulcerated cavity the ulcer will heal kindly; yet the bone will generally remain preternaturally enlarged.

Fistula in Ano.—Any abscess about the rectum, opening either within or without the anus, or both, is known by the term, *fistula in ano*. Fistulæ are so common in this situation, that some physicians, whose practice, "from being general is confined to a particular branch of their profession," have selected "diseases about the anus" as the particular field which is to engage their "profound attention." Fistulæ in ano are usually connected with piles, and both have habitual costiveness as their common cause, although the former is sometimes occasioned by wounds and injuries.

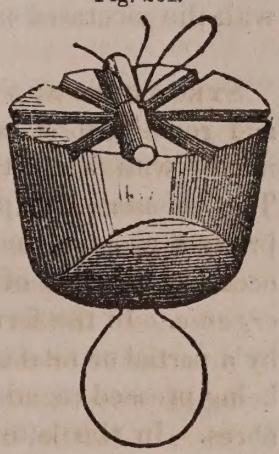
When there is an open communication between the rectum and the cutaneous surface, the fistula is called *complete;* and *incomplete* or *blind* when it communicates with but one; the latter is called *blind internal* or *blind external* fistula, as it opens into the bowel, or upon the external skin. In a majority of cases the fistulous pipe, or *sinus*, is tortuous and branching, several distinct openings being internally connected. The sinus is lined with a semi-cartilaginous, or callous growth, having the secreting property of mucous membrane, from which exudes a thin, yellowish pus; this indurated surface is generally extremely tender to the touch.

Treatment.—The "standard authors" on surgery are surely not well posted in the matter of *curing* the disease under consideration. *Their* plan of laying the ulcer open with the knife is always barbarous, generally unsuccessful, and sometimes fatal. More than twenty years

ago a self-constituted reform school of medicine in the city of New York, published to the world (*Dr. Beach's American Practice of Medicine*) a *successful* method of treatment; yet we do not find the *regular* professors adopting or commending it, perchance on account of its *irregular* origin. The main features of this method consisted in substituting the ligature and the caustic for the knife and the scarificator.

The first process is to subdue the inflammation and overcome the irritable condition of the ulcer, for which purpose frequent warm hip-baths, with the wet compresses, must be employed; after which the exact state of the cavity may be ascertained by the probe. The complete fistula may be ligated by passing the threaded probe from the external to the internal orifice, the string being brought down by the finger introduced into the rectum. The ligature is to be tied as firmly as the patient can well bear, and tightened a little daily. Dr. Hill's method—the best extant—of tightening the ligature is, before tying, to let the ends of the string pass trough a large vial cork, separating three fourths of an inch where they emerge, and passing over a little wooden roller, fitted to radial grooves cut on the end of the cork, fig. 201. These notches will hold the stick, after turning or twisting to tighten the string.

Fig. 201.



FISTULA LIGATURE.

While the process of ligation is going on, the caustic powder must be inserted by means of pledgets of lint to act upon and dissolve the callous or cartilaginous growths. If several sinuses exist they must all be managed in the same way, and every callous fissure must be thoroughly cauterized. The part should be frequently bathed or fomented with warm water when painful, and several folds of wet cloths, covered with dry, kept constantly applied, being retained in place by a T bandage.

When branching sinuses lead into or from the main one, they should be enlarged, and all the callosity along their course destroyed by the armed tent. A blind internal fistula should be opened with a pointed probe or the caustic, at the point nearest to the external surface, thus converting it into a complete fistula to be treated as above. The blind external fistula can often be cured by the armed tent alone; but if this fail, the threaded probe can be passed through the bottom of the sinus into the rectum, and the ligature applied.

It will usually take several months' time to cure bad cases of this affection; and during the whole course of treatment the patient's diet should be extremely simple, the bowels kept entirely free by injections.

and he should keep very quiet, resting much of the time in the horizontal position.

Fistula in Perineo.—A sinuous ulceration in the perineum is generally the result of a stricture in the urethra; the urine, thus obstructed, acting upon the lax structures of the part, often occasions extensive ulcerations, attended with very offensive discharges of purulent or sanious matter.

Treatment.—After the stricture has been removed, or the urethra dilated, as the case may be, a *gutta percha* catheter should be introduced into the bladder, and worn constantly; the hard, callous edges of the ulcer are then to be disorganized by the repeated application of the mild caustic, or the pure potash, if necessary. Before applying the caustic, the parts should be soothed with warm fomentations; and if the urethra is too irritable for the constant employment of the catheter, the patient should keep on his back while it is withdrawn, taking care to have the instrument introduced before he rises, so that the bladder may be emptied without allowing any urine to come in contact with the ulcerated parts.

Strictures and Fissures.—Strictures and fissures of the urethra and rectum, though not in any sense ulcers, are so intimately connected with fistulæ that they may as well be considered in this place. The membranous portion of the urethra, between the bulb and the prostate gland, is most frequently strictured, although a stricture may occur at any part of its channel. The disease may be *spasmodic* or *organic*. In the former case obstruction is temporary, and is produced by a partial or total obliteration of the canal in consequence of its sides being pressed together by the contraction of the surrounding muscular fibres. In the latter form the obstruction is permanent, and results from a morbid thickening of the mucous membrane. A partial organic stricture may become total by spasmodic action, superadded to the structural difficulty The most frequent cause of stricture is gonorrhea, or rather, the irritating drugs which are employed to cure it. Injuries from the passage of stone or gravel, and by surgical instruments, sometimes produce it.

Symptoms.—The spasmodic stricture is known by the sudden stoppage of the stream after it has reached the irritable spot; there is also a desire to urinate frequently and hurriedly. In the organic stricture the stream becomes crooked, gradually diminishes, and at length divides, and finally passes only in drops. The excretion eventually becomes yellow and purulent, evincing ulceration in the urethra or blad-

der. The constant habit of straining often induces hernia or piles; and when extensive ulceration has taken place, rigors and hectic fever are the precursors of a fatal termination.

Treatment.—The first measure is to relieve the bladder. When the stoppage occasions a tense, round, painful distention above the pubes, the catheter must be employed; the gonorrheal inflammation or irritation, when it exists, may be subdued by frequent warm hip-baths, followed by tepid, then cool, and finally cold; the bowels must be kept free by a simple opening diet, with tepid injections when necessary; and cold water should be drank as copiously as the stomach can comfortably bear. With the subsidence of the morbid irritation, the spasmodic stricture will usually disappear; but if not, the additional measures are necessary, which pertain particularly to the treatment of permanent stricture. These consist in dilating the urethra by means of gum elastic or gutta percha *bougies*, or destroying the stricture, which is usually confined to a very small space, by the application of caustic, or both. The dilating process is managed by introducing a very small bougie at first, and after it has been worn as much of the time as possible for a day or two, a larger one, and so on, until the constricted calibre is enlarged as much as possible. If sufficient relief is not obtained by dilatation, the caustic is the dernier resort. This is applied by means of a bougie *armed* with caustic potash, or nitrate of silver, and passed to the strictured point, against which the caustic is pressed for about one minute at a time. If there are several strictures, each must be cauterized successively. Another method, called *malaxation*, which consists in introducing a bougie through the strictured portion, and retaining it as long as possible, during which time pressure is made against the stricture by an external compress and bandage, to excite absorption, has been frequently successful. During all or any of these operations, the irritation must be kept down and constant relaxation of the parts maintained by very frequent warm hip-baths or fomentations. Indeed, a majority of cases will yield to the medical part of the hydrotherapeutic treatment, without any resort to mechanical surgery whatever; and the cases are extremely rare which will require any mechanical operation except the dilating process, provided all the patient's habits and management are thoroughly hydropathic. It should be generally known that, as a majority of strictures, of both the spasmodic and permanent kind, are produced by astringent and irritating applications employed to check gonorrheal or gleety discharges, so a majority will get well by reproducing the discharge; and this may generally be done by the persevering employment of warm local baths and fomentations.

Stricture of the rectum is a thickening and hardening of the intes-, resulting from constipation; it produces a serious difficulty in ssing the fæces, which are evacuated in small, contracted, elongated, or flattened lumps, or in a fine stream. As in the case of fistulæ, all callous formations must be removed by caustic; and the constricted intestine must be mechanically dilated. A piece of ordinary wood, covered with oiled silk, of a conical shape, about three inches in length, the smaller end just large enough to pass the stricture, and the other, about two inches in diameter, answers every purpose. It must be held by a T bandage, made of gum-elastic, and worn as long, and as frequently advanced as the patient can well bear; the rectum should be well cleansed with a tepid injection previous to each application of the dilator.

Fissures of the anus are ulcerous grooves in the rectum, extending upward from the orifice. The edges of the crack or fissure become thickened and hardened, and constantly exude a sanious fluid. These should be removed by caustic, as in the case of fistulæ, the patient kept quiet, the warm relaxant baths employed, and the general regimen strictly attended to.

Salivary Fistula.—Wounds of the face, which sever some one of the excretory ducts of the salivary glands, are often followed by an obliteration of the cavity of the duct, and the formation of a fistulous opening through which the saliva escapes upon the *outside* of the face. The difficulty may be remedied by making an opening with a small trochar, passed into the open end of the duct at the fistulous opening, and then inserting a gold or silver tube to guide the saliva into the mouth; after which the fistula may be healed by adhesive straps, or these aided by the mild caustic. When the injured parts are entirely healed, the canula or tube may be removed.

Fistulæ Lachrymalis.—In the true lachrymal fistula the lachrymal sac is distended to a tumor at the inner corner of the eye, which ulcerates and forms an opening through which the tears are discharged on the face, instead of passing to the nose. There is also a morbid secretion of the sac distinct from the tears, for which the mild caustic may be necessary; and the nasal duct may be so obstructed as to require probing, and the application of a tent.

CHAPTER VI

ABSCESSES.

An *abscess—aposteme—imposthume*—is a collection of purulent matter in a cavity, or in the substance of an organ or part of the body. Sometimes the pus is contained in an orbicular cavity lined by a cyst, and sometimes it is infiltrated into the meshes of the areolar tissue. The formation of an abscess is often preceded by chills, or shivering fits, called *rigors;* and just before suppuration takes place, the pain, tension, swelling, throbbing, etc., are increased. After matter is formed, a sensation of weight and throbbing continues in the part, and a conical projection soon denotes the pointing of the abscess, preparatory to its bursting and discharging its contents. Some abscesses will *point* in a week; others may not do so in several months. Generally a *fluctuation* may be felt in the swelling previously to its pointing. In order to distinguish the fluctuation of an abscess to the best advantage, two or three fingers should be placed on one side of the swelling, and the opposite side briskly tapped with the fingers of the other hand.

Deep-seated abscesses, and those formed beneath fasciæ and dense fibrous tissues, do not readily point, but they are attended with greater constitutional disturbance; and severer hectic symptoms, as shiverings, night-sweats, small, frequent pulse, etc. A sense of weight and coldness in the part will also succeed the acutely throbbing pain; and not unfrequently the integument over the abscess will become œdematous.

The general treatment of abscesses is precisely the same as that of inflammatory tumors and ulcers, preceding the formation of matter; after which, as a general rule, they are to be opened by cutting or cauterization—usually the former.

Empyema.—This is a collection of matter in the cavity of the pleura. Inflammations of the lungs or of their membranes occasionally result in suppuration, producing the abscess under consideration. It is known by a manifest enlargement of the side affected; a dry, tickling cough; laborious breathing, which is easiest in the erect posture; fixed pain in the chest, with difficulty of lying on the sound side.

Treatment.—In a few instances the matter has worked its way into the bronchial tubes and been expectorated, followed by recovery

When any thing is done surgically, it is the operation of *paracentesis thoracis*. An incision is made with the bistoury an inch and a half in length, through the integuments, usually at the upper edge, and a little behind the middle of the sixth rib; the intercostal muscles are carefully separated, and the point of the instrument passed in through the pleura costalis; a canula is then introduced, through which the matter escapes. Care must be taken that air does not pass in through the tube; to prevent which, the patient may incline, after the introduction of the canula, on the affected side; or a valvular instrument may be used. This operation has not been generally successful.

Maxillary Abscess.—This disease is an ulceration of, and collection of matter in the antrum of the upper maxillary bone. It is generally produced by the irritation of decaying teeth, and may exist for years, passing for toothache. It may be known by severe and obstinate pain in the face just below the prominence of the malar bone; the fetor is also extremely offensive to the patient, and to others about him. Sometimes there is a considerable discharge of offensive matter from the nose, and in some cases the face is much swelled and disfigured.

Treatment.—The inflammation and irritation should be allayed by derivative baths and local fomentations. The surgery proper in the case consists in extracting the second or third molar tooth, or both; and if the pus does not find a ready exit, a hole is to be drilled through the alveolus into the antrum about the size of a goose-quill; the cavity should then be repeatedly washed by injecting warm water; and if the fetor does not soon subside, a few applications of the mild caustic, in solution, should be made.

Mammary Abscess.—Abscess in the breast is sometimes the result of injuries, as blows, pressure, etc.; but generally it is the consequence of bad management or mal-treatment during the periods of gestation, childbirth, and lactation. The disease usually appears in four or five weeks after parturition; in about ten days thereafter suppuration takes place, beginning in several distinct parts, and forming many separate sinuses, all of which, however, communicate. It opens at one or several points.

Treatment.—This distressing affection is a standing disgrace to the doctor, the nurse, the patient, and all parties concerned. It is produced by the most foolish stuffing, and slopping, and stimulating, and heating, and drugging; nor is the usual method of doctoring the disease, after it has been artificially produced, half as well calculated to cure the

malady as to kill the patient. If promptly and properly treated, it can almost always be speedily resolved in its early stages. The constitutional treatment is more important than the local, and both should be managed on the plan heretofore recommended for visceral inflammation. The wet-sheet pack, or frequent tepid ablutions, with hip and foot-baths, are the general measures; and the constant application of several folds of wet linen, very frequently renewed and well covered, is the local appliance. Water may be drank freely, but the diet should be rather dry.

Onyx.—A collection of purulent matter between the laminæ of the cornea, having the shape of a nail, is so called in surgical technology. Its form, however, is nearly semilunar, like the white mark at the root of one of the finger nails. It usually occupies the lower edge of the cornea, and may be distinguished from *hypopyum* by its form and situation remaining unchanged in all positions of the patient's head. This affection can generally be removed by the appropriate remedies to reduce inflammation—on which its existence depends—and promote absorption. The head and eye-baths, a moderate douche, and derivative, hip, and foot-baths, are all serviceable.

Lumbar Abscess—Psoas Abscess.—This is one of the most formidable and fatal of abscesses. It commences with a dull, heavy aching in the lumbar region; pains shooting down the spine and thighs, and a lameness in one or both lower limbs, with a difficulty of standing erect; there is usually a drawing up of the testicle of the side more particularly affected; the patient is easily fatigued by exercise, and when lying down is disposed to flex the thighs or the abdomen. At length the local pain becomes throbbing, chills and night-sweats occur, a fluctuating enlargement appears along the psoas muscle, and the apex of the tumor presents itself immediately below the groin. The disease usually occurs in scrofulous persons, and is often connected with caries of the spine, in which case curvature of the spine and paralysis of the lower extremities are apt to result.

Treatment.—If detected in the early or forming stage, this disease requires thorough constitutional treatment, of which the pack-sheet daily is the leading process. The diet must be strict, the bowels kept open by injections, and wet cloths constantly applied to the painful part. If the treatment is not commenced early enough to prevent suppuration, the abscess, as soon as fluctuation is clearly detected, should be punctured to let out the matter. When the pus lies very deep, an opening may be made to it with caustic potash. After the abscess is

opened, moderate compression should be kept up, and the water-dressing continued.

Note.—Sometimes the swelling of a lumbar abscess in the bend of the groin so nearly resembles that of a hernial protrusion, that great difficulty is experienced in the diagnosis; and the difficulty is increased by the fact that the same impulse is communicated to the swelling when the patient coughs in either case. Usually, however, the swelling in lumbar abscess is larger and more toward the ilium. In cases of extreme doubt, a needle may be introduced into the tumor to ascertain the character of its contents.

Hip Disease—Coxarum Morbus.—This disease, like the preceding, is seldom cured in the regular way. It consists in an abscess originating from caries of the head of the os femoris; it generally occasions a luxation of the hip joint and a permanent shortening of the limb. The symptoms come on insidiously. Generally a slight pain in the knee is the first thing noticed. On a close examination the limb will be found elongated, which causes the knee to be slightly bent, and the whole limb more or less disfigured. At this period the pain will affect the groin, and may be severe. Extensive ulceration has generally taken place when purulent matter makes its appearance; this may be discharged at several points, although the abscess commonly opens in the groin. In some cases the head of the femur is not destroyed, and anchylosis results; but usually the head is dislocated upon the dorsum of the ilium, where it may form a new joint, and produce a deformed and shortened limb; when the head is entirely destroyed, the limb will be shortened several inches.

Treatment.—This does not differ essentially from that applicable to the preceding disease. When fistulous openings exist, their callous edges or fungous growths may require the caustic; and when they are connected, they should, if practicable, be converted into a single one by the ligature. In order to enable the patient, during the lengthy process of cure, to exercise in the open air, he should be supplied with crutches, and the limb should be dressed with gum-shellac, or other light splints, to keep the affected joint as motionless as possible.

Prostatic Abscess.—Abscess of the prostate gland is a result of acute inflammation, and may be known by rigors, with swelling, heat, and redness of the perineum externally. As soon as matter has formed, the abscess must be opened at once, lest the matter work its way into the rectum or urethra.

CHAPTER VII.

HERNIÆ, OR RUPTURES.

The terms *hernia* and *rupture* are commonly employed as synonymous; but writers who are strict in the use of language, apply the former word to all protrusions of the viscera or parts from their natural cavities, while the latter term is limited to abdominal protrusions. The word rupture, however, is always a misnomer, for it implies that something is burst or torn, which is not necessarily the case.

Varieties of Herniæ.—These are innumerable. They may involve the *brain*, *lungs*, *stomach*, *intestines*, *bladder*, the different portions of the *peritoneum*, and in rare cases, the *liver*, *spleen*, *uterus*, or *ovaries*. The parts commonly affected with hernia are the *abdominal viscera;* of these the *intestines*, or *omentum*, or *both*, are the portions usually protruded; and the *abdominal ring*, the *navel*, and a point at the inner side of the *femoral vein*, just below Poupart's ligament, are the *places* where herniæ most frequently appear. They are met with occasionally at all points of the *linea alba*, at the *foramen ovale*, the *ischiatic notch*, in the *perineum*, and in the *vagina*.

Technology of Herniæ.—This is derived from their contents and locality. A protrusion of the brain is called *encephalocele*, or *hernia cerebri;* of parts within the thorax, *pneumatocele;* of the stomach, *gastrocele;* of the intestine, *enterocele;* of the omentum, *epiplocele;* of both, *entero-epiplocele;* of the liver, spleen, bladder, uterus, etc., *hepatocele*, *splenocele*, *cystocele*, *hysterocele*, etc. Abdominal herniæ are distinguished according to the aperture from which they escape. At or near the navel they are called *umbilical—exomphalos*, or *omphalocele;* through the linea alba above the umbilicus, *epigastric;* through the linea alba below the umbilicus, *hypogastric*, *infra-umbilical*, or *cæliocele;* through the abdominal ring, *inguinal*, or *supra-pubian*, and this variety, when small, is called *bubonocele*, and in man, *oscheocele*, or *scrotal hernia*, when the intestine has descended into the scrotum, while in woman its extension to the labiæ is called *epiciocele*, or *vulvar*, *pudendal*, or *labial* hernia; through the crural canal, *femoral*, or *merocele;* through the opening which gives passage to the infra-pubian vessels, *infra-pubian;* through the sacro-ischiatic notch, *ischiatic hernia*

through the levator ani, and appearing at the perineum, *mesoscelocele*, or *perineocele*; through the parietes of the vagina, *coleocele*, *elytrocele*; and through the diaphragm, *diaphragmatocele*, etc.

"*Ventral hernia*" includes all forms of abdominal protrusion, except those occurring at the umbilicus, abdominal ring, or femoral sheath.

In inguinal hernia, the intestine may be arrested in the canal, after having passed through the internal abdominal ring, when it is called *incomplete* inguinal hernia; when it passes through the canal and emerges at the external abdominal ring, it is called *complete* inguinal hernia. Complete inguinal hernia is called *direct*, or *ventro-inguinal hernia*, when the bowel passes through the space between Poupart's and Gimbernat's ligaments, leaving the external ring and spermatic cord on the outside; and in other cases it is termed *oblique*.

Congenital hernia is the protrusion of some portion of the abdominal contents into the tunica vaginalis testis, owing to a want of adhesion between its sides after the descent of the testicle.

Pathological Distinctions.—In abdominal hernia the protruding part usually pushes along a portion of peritoneum, which forms a sort of pouch, and is called the *hernial sac*; the narrow part of which is the *neck*, and the expanded portion the *body*. The bladder and cæcum, however, not being contained in the peritoneum, do not have a complete sac; and in cases of wounds and ulcerations, the sac may be absent; nor does it exist in *internal* herniæ, in which there is really no protrusion at all.

In complete or direct inguinal hernia, there are *two necks*, one at the internal and one at the external ring.

Hernia is called *reducible* when the displaced part is attended with no disturbance of the general health, and is susceptible of being easily replaced; when incapable of replacement, from its size or from adhesions, it is called *irreducible* or *incarcerated*; and when the incarcerated part is constricted and inflamed, obstructing the passage of fæces, and causing violent pain and sickness, it is called *strangulated*.

Special Causes of Herniæ.—Surgeons tell us that blows, falls, violent exertions, as lifting, wounds, dropsy, abscesses, pregnancy, straining at stool, hard riding, and severe coughing, are the common exciting causes, while general debility is the general predisposing cause. All of these causes are favorable to these complaints, and some of them alone produce them; but *the* general and special cause is *costiveness*. Without this predisponent condition, most of the other causes named would be powerless. Many persons, perhaps a majority in re

fined society, scarcely ever go to stool without being obliged to strain dangerously, to respond to the "solicitation of nature." And when this straining has been kept up for years, it is not remarkable that very slight accidents should cause the "bowels to gush out" of their natural inclosures in the shape of hernial protrusions. Some have estimated the subjects of hernia to be one eighth of an entire population.

Diagnosis of Herniæ.—In a *reducible* hernia the tumor may appear gradually or suddenly at some one of the points above named; its size is changeable, being larger when the patient stands, and smaller when he lies on his back; compression will generally diminish it; it is usually more tense after a full meal, or when the patient is flatulent; when the patient coughs, an impulse may be felt at the tumor, as if air were blown into the swelling. When the sac contains intestine only, the tumor is uniformly smooth and elastic, and also painful to pressure; when it contains omentum only, the tumor is insensible, and has a more flabby, or doughy, and somewhat unequal feel; and when it contains both—*entero-epiplocele*—a part of the contents of the hernial tumor will slip up with a gurgling noise, leaving behind a portion less readily reduced.

Irreducible herniæ are distinguished by more or less difficulty in evacuating the bowels; colic pains are frequent, with a variety of dyspeptic symptoms. They do not usually occasion great inability or inconvenience, but are liable to *intussusception*—a slipping of one portion of bowel into another—and this is a dangerous and often fatal accident.

Strangulated hernia presents, first, an irritable condition of the parts affected, with a hectic flush externally, and a pain at the point of constriction; the pain generally extends to the diaphragm, followed by nausea, vomiting, obstinate constipation, rapid pulse, and general feverishness. The peristaltic action is often inverted, and fœcal matters are ejected from the stomach. If reduction is not soon effected, the bowels become distended with air, the abdomen hard and tense, the extremities cold, while hiccough, clammy sweats, and a sinking pulse, with a sudden *cessation of the pain*, denote the existence of mortification, and the approach of death.

General Treatment of Herniæ.—When the hernia is reducible, the protruded part is to be returned to its natural position, and maintained there by a truss, or other suitable contrivance. In some rare cases, however, the contents of the hernia are so bulky, or the parts so altered, that it is advisable merely to support the tumor with a

suspensory bandage, unless an attempt at a *radical cure* should be deemed expedient.

In irreducible cases the strictest attention must be paid to the diet, which should be so managed as to obviate the least tendency to constipation. With this precaution, the use of a truss or bandage, and the avoidance of all rough exercises, the patient may "live through life" very comfortably.

But when the reducible variety suddenly becomes incarcerated, and in all cases of strangulation, the first attempt at relief should be by the *taxis*, or hand operation. The taxis can almost always be successfully performed by any one who has a clear idea of the mechanism of the part and the existing obstacles.

The patient is to be placed in a horizontal posture on the sound side—these directions apply particularly to inguinal and femoral hernia, other varieties not requiring special instructions—with the hips elevated, the chest inclined forward, the thigh of the affected side flexed upon the abdomen, and drawn toward the other—all of which is intended to relax the muscles and integument at and around the protrusion. The sac is then to be gently grasped, and moderately elevated and compressed with one hand, while the forefinger of the other hand presses as much of the tumor as possible up to and within the point of protrusion; the returned portion is to be retained while the middle finger pushes up another portion, when the forefinger may be again employed for still another portion; the middle finger holding the part *it* has brought up or the ring finger may be used, while the others are both occupied in holding the advantage gained. In this way the whole tumor is to be removed.

In the *external inguinal hernia*, the pressure must be directed *upward* and *outward*, along the course of the spermatic cord; but in *femoral hernia* it is to be directed first *downward* and then *backward*. In *umbilical* and *ventral hernia* the pressure is to be made directly *backward*. Violence must never be used, nor the parts handled so roughly as to occasion much pain.

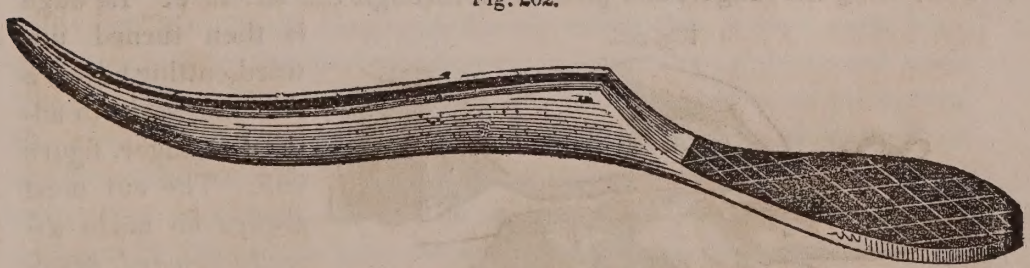
Several circumstances, however, may interfere with the operation of taxis, or defeat its successful result, as extreme distention of the protruded intestine, great pain and tenderness, active inflammation, severe constriction around the neck of the sac, etc.; but these things should not discourage us. We have in *cold water* or ice a suitable auxiliary for the first-named complication; its assistance will often enable us to succeed at once. When the part is excessively tender and irritable, *hot water* must be brought in requisition. The full warm bath, or local fomentations, or both, may be employed, and these may be followed by

a reapplication of the cold process. Our "old school" friends, on *their* characteristic principle, that when a patient is suffering locally, he ought also to be made to suffer constitutionally, recommend *tartar emetic* and *bleeding* to produce *sickness* and *faintness*, with a view of bringing about *relaxation* and *quietude;* but warm water externally, and internally by injection, may be made to produce any degree of these effects which can be desired. After the employment of either of these water processes, the taxis is to be tried again.

There is yet another resource in bad cases—*dry-cupping*—which Dr. Hill (*Eclectic Surgery*) significantly calls *traction from within*, and which is not mentioned in any other work with which I am acquainted. A large cup, or any convenient vessel, may be applied to the abdomen, covering the umbilical region, in which a piece of burning cotton is placed to exhaust the air; the "suction" thus established will *pull* upon the protruded intestine while we may be *pushing* from without. Holding the patient's heels up, and head down, and jouncing him in that condition, has succeeded in "domestic practice," in reducing a rupture, of which Dr. Hill gives a notable instance.

In extreme cases, when the strangulation with inflammation has existed, despite the efforts to reduce it, for twelve or fifteen hours, the only chance for the patient is by the operation with the knife; yet this does not afford him quite an equal chance to live. It consists in making an incision through the skin three or four inches in length, along the course of the tumor, cutting through the successive layers—described in the first part of this work under the head of "Anatomy of Hernia"—or coverings, by picking up a small bit at a time with the forceps and cutting horizontally through it under their points, until an opening into the sac—which can be distinguished by its bluish appearance—is made. "The sac"—I quote substantially from Dr. Hill—"is then opened in the same manner, and the small director, fig. 202, inserted, and an opening

Fig. 202.

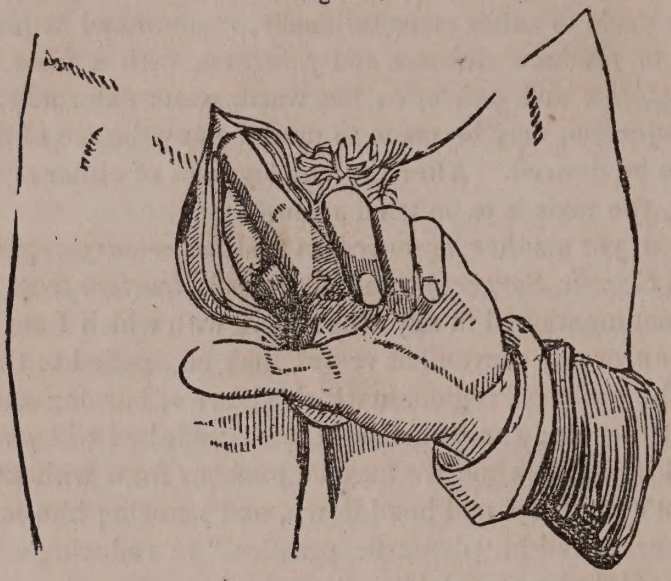


THE SMALL DIRECTOR.

made large enough to admit a finger. The forefinger of the left hand is

next introduced, fig. 203. and passed up to the neck of the sac to find

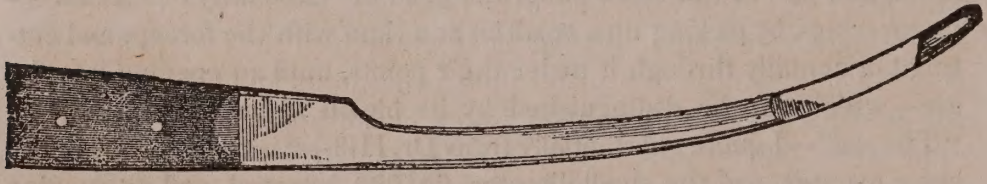
Fig. 203.



OPERATION FOR STRANGULATED HERNIA.

the stricture, which may be at the internal or external ring, or at both places; the stricture should be sufficiently dilated to permit the finger to enter the abdomen; this may be done by the probe-pointed bistoury, or similar knife, made for the purpose, not edged quite up to the point, nor but a short space below it, fig. 204. The blade is passed up *flat-*

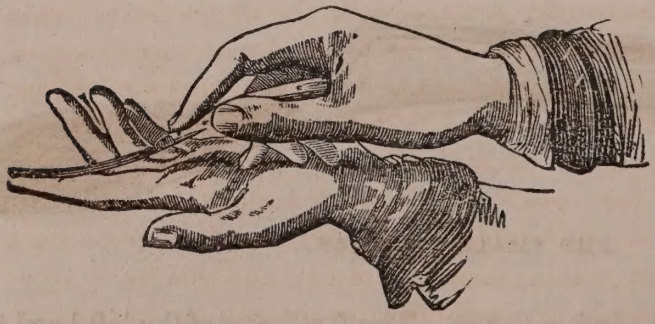
Fig. 204.



HERNIAL BISTOURY.

wise, along the finger, and pushed on through the stricture. Its edge is then turned upward, cutting no more than necessary to admit the finger, figure 205. The cut must always be made *directly upward*, parallel to the linea alba, to avoid the epigastric artery. After

Fig. 205.



CUTTING THE STRICTURE

the stricture is thus relieved, the parts must be examined, and if firm adhesions have taken place, or fatty deposits accumulated largely, no attempt at reduction must be made, but the wound allowed to heal. When mortification has taken place, the only chance is by an artificia. anus. In femoral or crural hernia, the sac is usually very small, and embraces the bowel very tightly; hence it must be opened with caution.

Radical Cure of Hernia.—Beyond the *taxis* for reducing displacement, and the *operation* for relieving strangulation, little or nothing has been done for this class of invalids in the way of *regular* surgery, while *mechanical* skill has generally been content to prevent further mischief by the constant application of a truss. But it has been noticed that in recent cases the pressure of a truss has sometimes excited adhesive inflammation in the parieties of the canal between the abdominal rings, or in the femoral sheath, and thus closed the passage against all future danger. Acting on this hint, others have succeeded in some *recent* cases, by keeping up as strong pressure as the patient could bear, by means of a truss with a large and hard pad, so applied as to compress the whole canal or sheath through which the viscera had passed. Others have succeeded in cases of long standing, by adding to the *mechanical-pressure* treatment, that of *vital irritation*, the combined effect of both being to produce the requisite degree of adhesive inflammation to obliterate the canal, sheath, or cavity, where the rupture presents. Professors Morrow and Hill, of Ohio, employ an *irritating-plaster*—compounded of bloodroot, mandrake, wake-robbin, pokeroot, tar and rosin—large enough to cover the whole canal or sheath—two to two and a half by three to three and a half inches—over which the truss is worn, the pad of which is nearly as large as the plaster. The part is first shaved, the plaster applied, and then the truss is adjusted as tightly as the patient can bear, the compression being diminished as the parts grow tender. The truss is removed daily, and the plaster re-spread, during which the patient must keep perfectly still in the horizontal posture, with the thighs flexed upon the abdomen. When the truss cannot be longer borne on account of the pain, it is substituted by a *compress* and *bandages*; and while these are worn the patient is recommended to keep on his back. A point of practice especially insisted on is, that no protrusion must on any account be allowed to take place during the treatment. Should the pain and irritation become intolerable, the plaster is to be omitted for a few days, a slippery elm poultice taking its place; and this the hydropath could readily supersede by simple flour to the surface, over which

warm wet cloths might be applied. It is contemplated, by this plan of treatment, to excite a purulent discharge from the surface covered by the plaster, and keep up the suppuration from four to six weeks.

The principle upon which this cure is predicated is clearly correct; and a score of physicians, all understanding the principle, might find a score of ways to apply it successfully. It can matter but little what the irritants are, provided they produce precisely the proper degree of irritation, and do not poison the system from absorption. An astringent plaster, made of the extracts of hemlock, white oak, green ozier, and the common or rock break, with the occasional application of a few drops of *oil of eggs*, in combination with the pad and truss, constituted the empirical but rather successful plan of Hurlbutt's treatment of hernia, for which he obtained a patent.

Umbilical and Ventral Herniæ.—Infants are most subject to *umbilical* hernia; the protrusion is generally imputed to straining while crying, when the abdominal bandage which is placed around the body is *too loose*. This is one among many great errors which have crept into professional men's minds. The truth is, that this bandaging the body is just what produces the rupture in a large proportion of cases. It is this that makes the child cry and strain; and the tighter the abused infant is girded with it, the more it will cry and strain, and the more liable it will be to have a rupture. It sometimes occurs in parturient females from the muscles giving way during the powerful contractions upon the gravid uterus.

Treatment.—The protruded portion of bowel can generally be reduced very easily by the hand, after placing the patient on the back, with the shoulders moderately elevated, and the thighs flexed upon the abdomen. A sufficient degree of adhesive inflammation to effect a radical cure may be excited by a modification of the plan proposed for the preceding varieties. A much less amount of external irritation will usually answer the purpose, and the pad of the truss, by which the compression is made, must be so adjusted that the pressure will keep the sides of the aperture constantly in contact. Dr. Hill gives the following directions for the mechanical treatment, which I copy as the best extant: "Take a circular piece of the thick spongy portion of sole leather, of the proper size to cover the opening, and extend from one and a half to two inches all around it. Excavate the fleshy side of the leather, so as to make it regularly concave, the center of the depression being about half an inch below the plane of the circumference. Place the patient in the position for reduction, and bring the parieties of the hole in the muscles in contact, so as completely to

close the orifice, by pressing from the sides, while the muscles are in this relaxed condition. The edges being thus kept in contact, apply, directly over the point of protrusion, a layer of raw cotton or soft lint, wet in a strong decoction of white-oak bark. This application should be just large and thick enough to fill the excavated surface in the leather, without causing any pressure. Apply your leather pad over it, and secure it by a bandage passed round the body, sufficiently tight to compress the muscles, and keep in contact the parieties of the aperture. It is better to fasten the pad to the bandage before it is applied. This should be kept on six or eight days without being removed, unless it produce too much irritation. It should be wet once or twice a day with the oak decoction, by applying it upon the surface and allowing it to soak through the pad and cotton." One or two weeks will often suffice to produce adhesion in an infant, while an adult may require the treatment for one or two months. While removing the dressings the patient must be placed in the position before described, and the walls of the abdomen firmly held by an assistant, so that no motion be allowed to interrupt the adhesive process.

CHAPTER VIII.

DEFORMITIES.

THE deformities which result from accident, disease, or malconformation, are innumerable; but an understanding of the principles which apply to the management of those which are common, will readily suggest the modifications applicable to unusual cases.

HARE-LIP—LABIUM LEPORINUM.—This is a fissure in the upper lip, which may be single or double. In the former case it is usually on one side of the mesial line; in the latter each fissure extends downward and outward from one of the nostrils, as in fig. 206. In some cases the division extends backward through the palate bone, and often the front teeth project through the fissure, adding greatly to the deformity.

Fig. 206.

DOUBLE HARE-LIP.

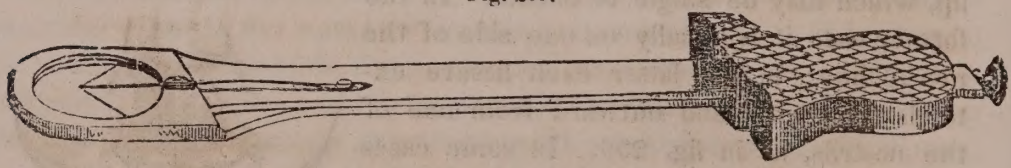
Treatment.—The operation of tying by the twisted suture is the

only remedy. The edges of the fissure are raised with the fingers or forceps; a flat piece of wood is placed between the lip and gum; and the edges are then pared off from both sides upon the wood with a scalpel or bistoury, leaving the edges straight like the shape of the letter V. The bleeding can be stopped by sponging with cold water, after which a thin sewing needle is passed through and across the fissure near its lower extremity; the needle must penetrate nearly to the inner surface of the lip, which will keep the inner edge together while the ligature secures the outer edge. After this needle is secured by the thread two others are to be introduced above at proper distances, and the part dressed with wet lint, over which a bandage is applied, and kept constantly wet with cold water. Adhesion will take place in about a week, during which time the patient must be kept very quiet; after this time the needles may be removed and adhesive straps applied. When two fissures exist each is to be treated in the same way, and both should be operated upon at the same time. When projecting teeth are in the way they should be extracted.

Tied Tongue.—Notwithstanding I have had some fifty applications to cut babies' tongues, I have never yet seen a case of this kind. It is an extremely rare occurrence in reality, though very apt to exist in the imagination of nurses. When the *frenum linguæ* is extended to the tip of the tongue, firmly holding this "unruly" member to the floor of the mouth, and preventing the child from sucking, it is a *tongue-tie*; and then the surgeon may elevate the member with one or two fingers, and snip the string across as near the floor of the mouth as possible, with a pair of scissors. The cut should rarely extend beyond one eighth of an inch.

Enlarged Tonsils and Uvula.—These are rather inconveniences than deformities; yet it is sometimes advisable to excise them. The proper instrument for doing this, fig. 207, has an angular or rounded

Fig. 207.

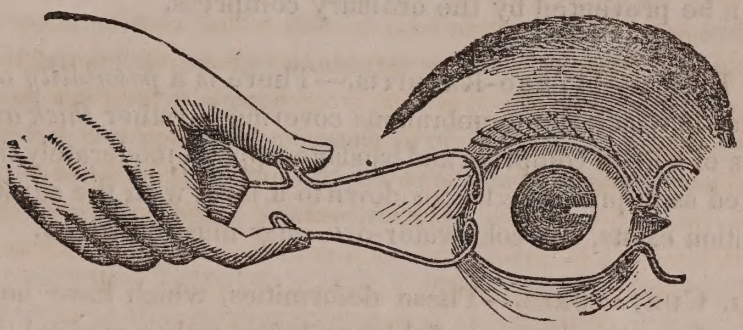


INSTRUMENT FOR EXCISING THE TONSILS AND UVULA.

blade, which can be drawn back, leaving a ring to be passed over the part to be removed, after which the blade, armed with a needle to prevent the excised portion falling into the throat, is pushed forward against the tumor.

Squinting—Strabismus.—In the majority of cases of permanent squinting, the difficulty is owing to a disproportionate contraction in the recti muscles, one being too much relaxed and the other preternaturally contracted. The remedy consists in a division of the *contracted* muscle, and this is usually the *internal rectus*. The eye is secured and held by the wire-spring speculum, fig. 208; a double-hook is then

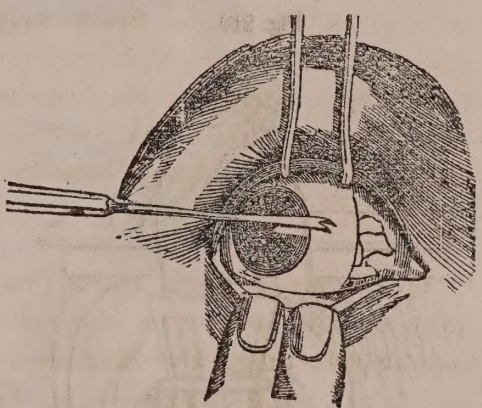
Fig. 208



SPECULUM APPLIED TO THE EYE.

hitched to the conjunctiva midway between the margin of the cornea and internal canthus, by which the ball is rolled outward, as represented in fig. 209, and the handle then held by an assistant. The operator next raises the conjunctiva with fine hook-forceps, cuts into it perpendicularly with the curved scissors, and continues to raise and divide the cellular tissue until he reaches the muscle, when he severs it with the scissors.

Fig. 209.



OPERATION FOR STRABISMUS.

If the muscle has been completely divided, the patient, on having the eye released, will be able to turn it in all directions, except directly inward. After the operation, the eye requires to be kept covered for a day or two with a wet cloth.

Superfluous Fingers and Toes.—Supernumerary appendages to the hands and feet are not of much consequence; but as they are not usually attached by a regular joint, they may readily be got rid of by means of the ligature or knife.

Web Fingers.—These only require division by the scalpel, and to

be prevented from reuniting by a piece of oiled silk kept between the fingers until cicatrization takes place.

Wry Neck.—If this deformity is so great as to render an operation desirable, the constricting muscular tendon or fascia is to be divided with the knife. The incision should be as superficial as possible; when the muscle has been completely divided, it will *snap* back. The hemorrhage can be prevented by the ordinary compress.

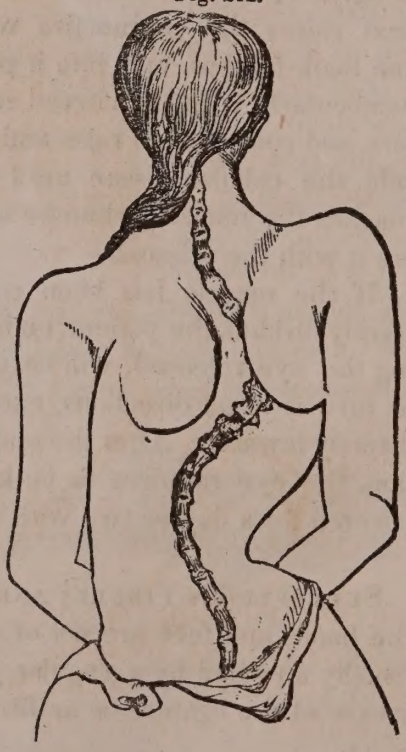
Spina Bifida—Hydro-Rachitis.—There is a *possibility* of curing some cases in which the membranous covering is rather *thick and firm*, by means of a linen compress and bandage, applied moderately tight, and so adjusted as to press the tumor down to a level with the surface. If inflammation exists, the cold water-dressings must be added.

Spinal Curvatures.—These deformities, which have been considered in the preceding part of this work, are rather medical than surgical maladies; and the subject is only introduced here to add an ocular demonstration of the theory advanced in relation to their predisposing and proximate causes. Fig. 210 is a representation of a single curva-

Fig. 210.

MISPOSITION AT WORK.

Fig. 211.



DOUBLE CURVATURE.

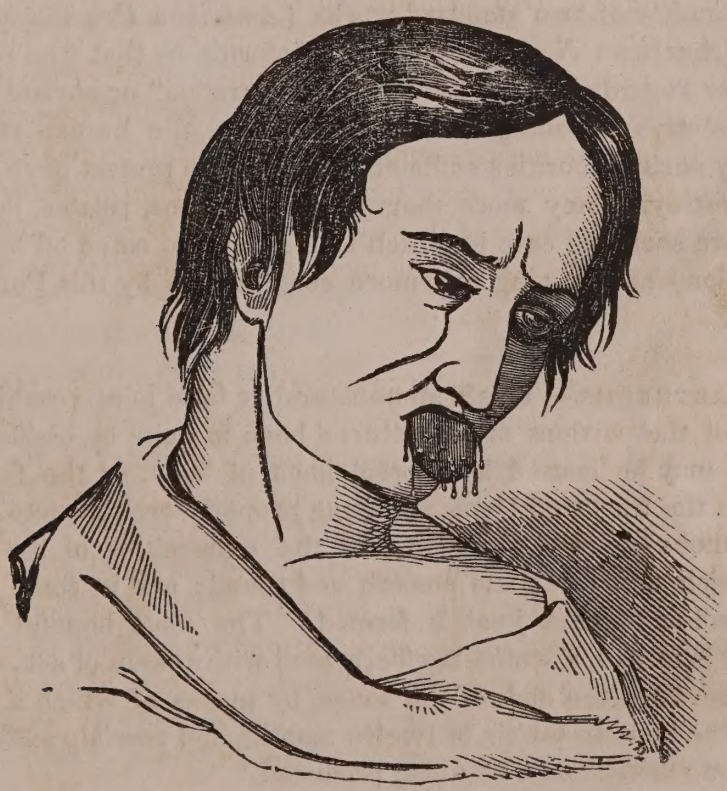
ture in its forming stage, occasioned by a habitually-improper position at a work-table, which is raised too high. Those who have a clear idea of the manner in which these ailments originate, will at once appreciate the absurdity of the ordinary treatment with mechanical machinery and surgical cauterization, by which many poor backs have been cruelly tortured and many bodies permanently crippled. An extreme result of the same cause is seen in the curvature, fig. 211.

Scrofulous persons, from their greater frailty or laxity of organization, are peculiarly liable to lateral curvatures, when exposed to any causes which debilitate the muscular system, or throw the different sets of muscles out of balance.

In double curvatures the misposition of body is generally connected with causes which tend especially to debilitate the abdominal muscles, as constipation, hot drinks, feather beds, etc.

MERCURIALIZED TONGUE.—This is both a cruel disease and a horrid deformity, as the accompanying representation will bear witness, fig. 212, and I introduce the subject in this place for the especial pur-

Fig. 212.



SALIVATION

poses of protesting against its cause, and against the treatment which those physicians whose "healing art" creates the disease, recommended to cure it. This treatment consists in making long and deep incisions into the tongue with a scalpel. It is not strange that those practioners, whose "remedies" produce such consequences, should be the poorest doctors in the world when those consequences themselves require medication. Nothing will reduce this violent mercurial inflammation equal to the wet-sheet pack, so managed as to produce moderate but frequent perspiration. At the same time the bowels must be kept very free with tepid injections, the wet compress applied to the neck, the mouth frequently rinsed with cool but not very cold water, and sips of cool or cold water—as either is most agreeable to the patient—swallowed whenever the patient has the ability to swallow. When the body is extremely sensitive to cold, a tepid ablution, followed by the dry pack, is the best way to promote a perspirable condition of the skin, and this may be frequently repeated.

Professor Chapman, in a text-book for medical schools (*Materia Medica*), tells us that "Occasionally mercury, from some *unaccountable* cause, instead of operating as a remedy, acts as a poison;" and Dr. Thacher, author of two standard works (*American Practice of Medicine*, and *American New Dispensatory*), informs us that "no rules can be given or regarded to regulate its administration" or obviate the uncertainty always attending its introduction into the human stomach; and surely such authorities sufficiently sustain the protest here entered against destroying any more tongues, teeth, gums, palates, jaws, and lips—I have seen one case in which both lips were eaten off by a mercurial action—and ruining any more constitutions by this Paracelsian quackery.

Pseudarthrosis.—This is an unnatural or false joint, resulting from a failure of the portions of a fractured bone to unite by ossification or callus; it may be caused by morbid habit of body, or the fault may arise from the fractured bones not being properly brought into contact. A ligamentous capsule forms around the extremities of the broken bones, which finally become smooth and round; and in some cases a regular ball-and-socket joint is formed. The most hopeful plan of treatment is to pass a seaton-needle, armed with a skein of silk, through the limb between the ends of the bones, by means of which a running sore may be kept up for six or twelve months, and *possibly* adhesive inflammation excited and a re-union produced.

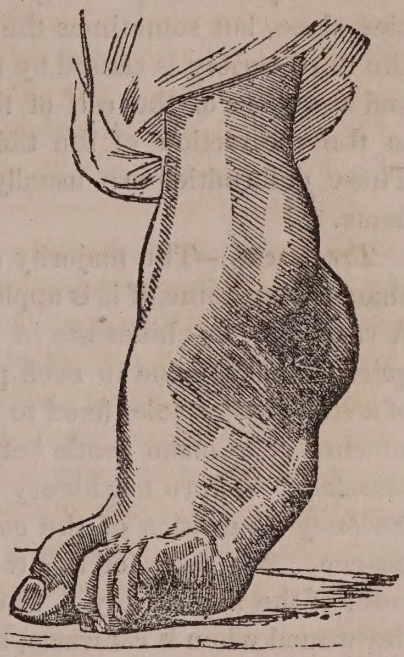
Club-Foot—Talipes.—Surgeons distinguish four varieties of this

deformity. In the first—*talipes varus*—fig. 213, the foot is turned

Fig. 213.

TALIPES VARUS.

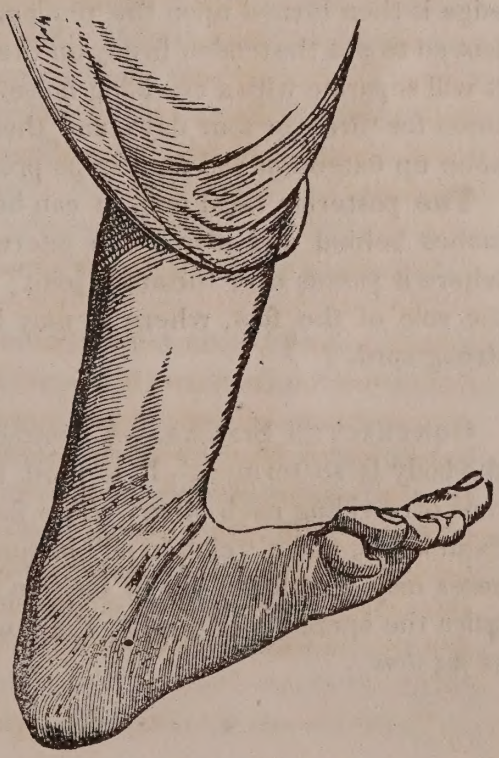
Fig. 214.



TALIPES EQUINAS.

inward, the patient walking on the outside of it, the heel being elevated. In the second variety—*talipes equinas*—fig. 214, the heel is more or less elevated, the patient walking on the ball of the foot or on the toes, and pressing equally on all the toes, or principally on the side of the little, or that of the great toe. In the third—*talipes vulgus*—the foot is turned out so that the patient walks on the inner surface, the external edge being raised from the ground, and the sole standing outward; and in the fourth—*talipes calcaneus*—fig. 215, the toes and foot are elevated to an acute angle with the leg, the heel resting on the ground.

Fig. 215.



TALIPES CALCANEUS

Causes.—The first variety is produced by a contraction of the

muscles of the calf of the leg and the adductors of the foot; the second variety is usually owing to a contraction of the gastrocnemii muscles alone, but sometimes the flexors of the toes are also contracted; the third variety is caused by the contraction of the adductor muscles, and also those of the calf of the leg; and the fourth variety is owing to the contraction of the tibialis anticus and the extensor muscles. These deformities are usually congenital, but may result from accidents.

Treatment.—The majority of cases can be remedied by proper mechanical apparatus, if it is applied early—say before three years of age. A variety of machines are in use, and the skill of the surgeon is required to adapt one to each particular case. They consist essentially of a stiff shoe or sole, fixed to an upright shaft, to which springs are so attached as to make gentle but constant extension against the contracted muscles. Where machinery fails, or is not applicable, the operation of *tenotomy*—a division of the contracted tendon or tendons—is the only chance. A division of the tendo achillis is sufficient in a majority of cases of the first variety. The skin is drawn tense so that it will cover the wound when it contracts, and a long, narrow-bladed knife is passed through the skin flatwise between the tendon and the bone, near the anterior surface of the tendon, one or two inches above the internal malleolus, and carried through to the skin on the opposite side; the edge is then turned upon the tendon, and while an assistant bends the foot so to put the tendon firmly on the stretch, this is cut through, when it will separate with a crackling noise. The limb is kept in an easy position for three or four days, and then placed in a suitable machine to keep up extension and fix it in its proper situation.

The posterior tibial muscle can be most readily divided about two inches behind and above the internal malleolus; the anterior tibial, where it passes over the ankle joint; and the flexor of the great toe on the sole of the foot, where it may be seen and felt projecting like a strong cord.

Contracted Sinews.—A contraction of the flexors of any part of the body is so termed. It is most frequently seen in the fingers or toes over-riding each other. The fingers are also contracted from inflammation, and a "club-hand" is sometimes met with. Some of the cases may be relieved by an incision through the skin; but others require the operation of dividing the tendon or muscle affected—*tenotomy* or *myotomy*.

CHAPTER IX.

DISLOCATIONS.

TECHNOLOGY.—A displacement of one bone from its natural articulation with another is called a *simple* dislocation, when unaccompanied with external laceration or fracture; and *compound* and *complicated*, when those conditions co-exist. Its readjustment is termed *reduction*. The mechanical means employed in reduction are *extension*—the force applied by the surgeon on the luxated part; and *counter-extension*—the force employed to fix the body in position, which may be by machinery, such as pulleys, or by the hands of assistants. Dislocations are called *partial* when the bone is moved out of position *in* its socket, or on its articular surface, without being thrown completely out or off.

Symptoms.—A dislocation is known by a change in the external *form* of the joint; an alteration in the *length* of the limb; the altered axis or *position* of the limb. The patient may have the power to move the limb *immediately* after the accident. When considerable swelling has taken place, it is often extremely difficult to distinguish between a dislocation and a fracture *near the joint*. When muscles are ruptured, there is great effusion and inflammation in the part.

Treatment.—The principal obstacle in the way of reduction is the contraction of the muscles; and this difficulty increases with the length of time the part has been displaced. When luxation has existed for several weeks, adhesions are apt to occur, forming a new joint or an anchylosis, and rendering reduction impossible without a new dislocation, and doubtful with.

Very soon after the accident the displaced bone can generally be replaced with very little force. But when the muscular contraction is strong, we must employ, in addition to extension and counter-extension, warm water to the part to relax the muscles particularly implicated; and in severe cases, the full warm-bath, to relax the whole muscular system; and in extreme cases, the patient must also drink plentifully of warm water, and have the throat frequently tickled, to excite and maintain considerable nausea. The extending force should always begin gently, and be gradually increased, while the counter-extension should, of course, be fixed and uniform. The limb should be slightly flexed, so as to favor relaxation In dislocations of the shoulder, the

extension bandage should be applied to the forearm; and in dislocations of the hip, above the knee. As the patient's mind, directed to the injury or operation, increases the contractility of the muscles, adroit surgeons often contrive some way of diverting it, at the moment when extension has been carried to a sufficient extent, as by smashing a window, communicating tidings of some awful accident, etc. When the bone returns to its socket, a "snap," like that of a lock when the key is turned, can be heard, and generally felt. The after-treatment is simply a bandage wet with cold water for a few days.

There is a *general plan* by which many, perhaps a majority, of dislocations, can be replaced by persons entirely ignorant of anatomy This consists in *drawing the limb out of place* as much as possible, in the first place—that is, extending it, and then, while the patient's mind is diverted to something else, making a *sudden rotary motion*, during which the bone generally slips into its place. Many marvelous stories have been told of Dr, Sweet and other "natural bone-setters," who have frequently succeeded by this method, after the scientific surgeon had failed; they were called *natural* bone-setters, because they were not professionally educated.

The following remarks of Mr. Skey, on "The Reduction of Dislocations Generally," are exceedingly valuable:

"In the endeavor to reduce a dislocation, the line of traction should hold reference less to that of the socket, or surface from which the bone has been displaced, than to the more important purpose of easing it from the surface, on which it has lodged. For example, the rim of the glenoid cavity, in dislocation of the humerus, presents an obstacle to the extension of the bone in the immediate line of that cavity; but if the bone be drawn off it by extension made in any oblique direction, the instant this ridge is passed, the head will rush back into its natural cavity. So, also, in dislocation of the femur on the dorsum ilii, we do not attempt to draw the bone in a direct line with the acetabulum, but we carry it below, round its back and elevated margin, and no sooner does it reach the lower part of the rim, which is much less prominent than the upper and back part, than the muscles immediately restore it to its socket. The same rule holds in dislocation of the ulna and radius backward at the elbow-joint. I believe the exact line of extension to be much more readily determined, and, in truth, a less important subject of consideration, than it is generally deemed. I believe that if we bring the bone sufficiently downward, and place it in the *neighborhood* of the articulation, the muscles will replace it with as much ease as that which originally dislocated it.

"The bone appears, as it were, sucked violently into the socket, even

at the instant of its sustaining the greatest force of extension. Then is it that the muscles, acting with one accord, set at naught the extending power, and complete the work of reduction, in defiance of all the agents employed at the moment to prevent it. I consider that the muscles are the immediate agents of reduction, and not the surgeon, whose entire duty consists in placing the bone in a position to give them the opportunity of displaying this harmony of action, and of exercising a power, even beyond that of the mechanical agents of extension. It is this power that succeeds in forcibly drawing backward the head of the femur into its cavity, when it has fairly reached the rim of the acetabulum, notwithstanding the force employed at that instant in extending it. In the examples of the larger dislocations, I place no reliance on any of the above-mentioned efforts of manipulation, but depend almost entirely on the act of simple extension, in the fullest confidence of the disposition of the joint to right itself if the obstacles be removed."

DISLOCATION OF THE JAW.—This accident arises from yawning or gaping, or from a blow on the chin when the mouth is wide open. It may affect one or both sides. Fig. 216 represents the appearance of the mouth in a dislocation of both articulations. The mouth remains wide open, the saliva runs constantly, and there is often alarming but not dangerous pain.

Fig. 216.

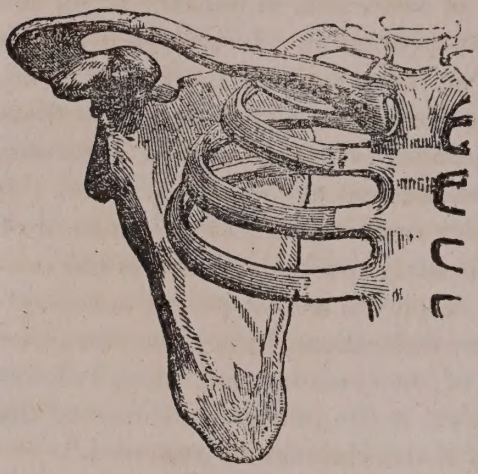
DISLOCATION OF THE JAW.

Treatment.—The reduction is easily affected. Place two pieces of soft wood, or large corks, as far back between the teeth as possible, to act as *fulcrums;* then, while the head is held by an assistant, press the chin steadily *upward* and *backward.*

Another method is: place the thumbs on the back teeth, and the palms of the hands and fingers on the sides and under surface of the jaw; then press *downward* with the thumbs, and *forward* and *upward* with the hands; the thumbs must be removed as the joint slips in its place.

DISLOCATION OF THE CLAVICLE.—The collar-bone may be displaced at its sternal or scapular extremity; in the former case it is pushed forward or backward, and in the latter generally upward. Fig. 217 shows its situation when dislocated at the breast-bone. In thin persons the nature of the injury is obvious at a glance; but with very fleshy individuals the diagnosis is sometimes difficult. Moving the shoulder, however, occasions great pain; and it is with much difficulty that the patient can move it at all.

Fig. 217.

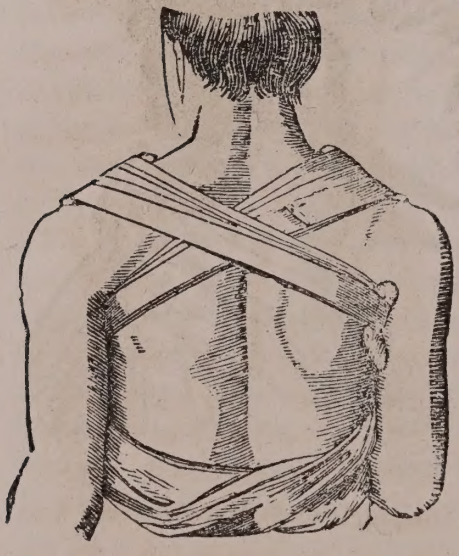


CLAVICULO-STERNAL DISLOCATION.

Treatment.—By pulling the shoulder backward and slightly outward, the collar-bone is drawn down to a level with the breast-bone, when the head will readily fall into its proper place.

To retain it in position, surgeons have a *clavicle bandage*, which is buckled round the body and round the shoulders with a soft pad in each armpit, and another on

Fig. 218.



CLAVICLE BANDAGE BEHIND.

Fig. 219.

CLAVICLE BANDAGE ANTERIORLY

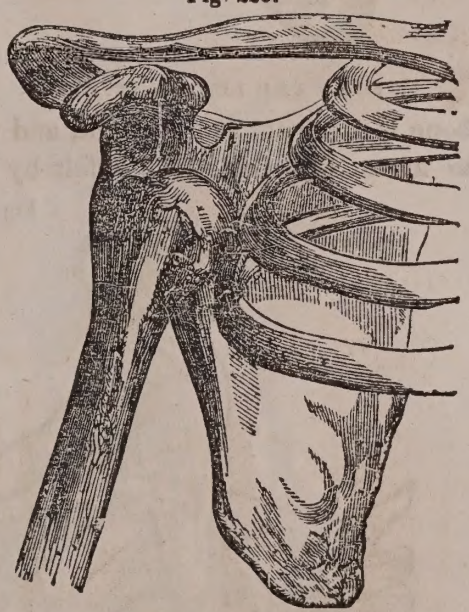
each shoulder. It is applied in different modes by surgeons, and incloses the arm, as it were, in a sling. A back view of it is seen in fig. 218, and a front view in fig. 219, which will enable any person of ordinary tact to adjust it successfully. The arm is previously supported in a sling.

When the scapular end is dislocated, the shoulder on the injured side is *depressed*, as compared with the other, and also *drawn inward* toward the sternum. In reducing it, the surgeon, standing behind the patient, places his knee between the shoulders, and draws them both backward, until the clavicle sinks into its place. The arm-sling and clavicle bandage are so applied as to keep the arm pressing slightly *upward* and backward. Some degree of deformity will always exist after these accidents.

DISLOCATIONS AT THE SHOULDER-JOINT.—The head of the humerus may be displaced *downward* into the axilla, *forward* under the clavicle, *backward* upon the dorsum of the scapula, and partially luxated *upward* against the outer side of the coracoid process.

Symptoms.—In the *downward luxation*, fig. 220, the head of the bone is readily found in the axilla, or resting on the lower side of the inferior costa of the scapula; there is a tumor-like projection in the armpit, and a corresponding hollow below the acromion process. The whole form of the shoulder is changed, the muscles being flattened, and the arm seemingly elongated; the elbow cannot be brought to the patient's side without great pain, and the patient inclines to separate his arm from the body and support it with the other hand. When the accident has existed for a considerable time, an effusion of lymph into the joint may occasion a *crepitus* on moving the arm, something like the *grating* sound of a fracture. In the *forward luxation*, fig. 221, the head of the humerus can be plainly felt, and generally seen upon the pectoral muscle below the clavicle. The point of the acromion process is very distinct, and beneath it is a considerable hollow. The coracoid process is on the outside of the displaced

Fig. 220.

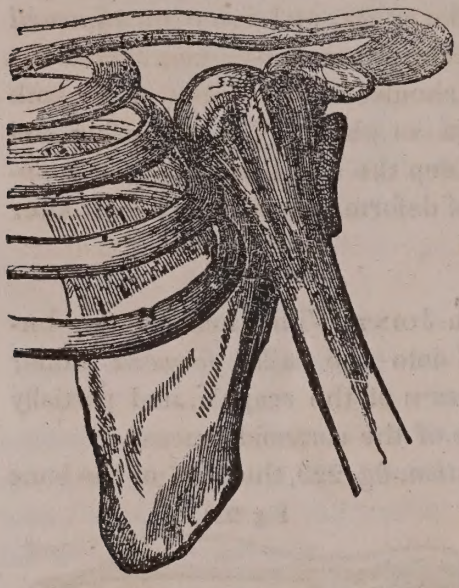


DOWNWARD LUXATION.

head, which, when the arm is rotated, can be observed to move. The elbow is thrown further back than in the downward luxation, the arm is much shortened, and there is great difficulty in moving the arm in any direction.

In the *backward luxation*, fig. 222, the projection of the head of the

Fig. 221.



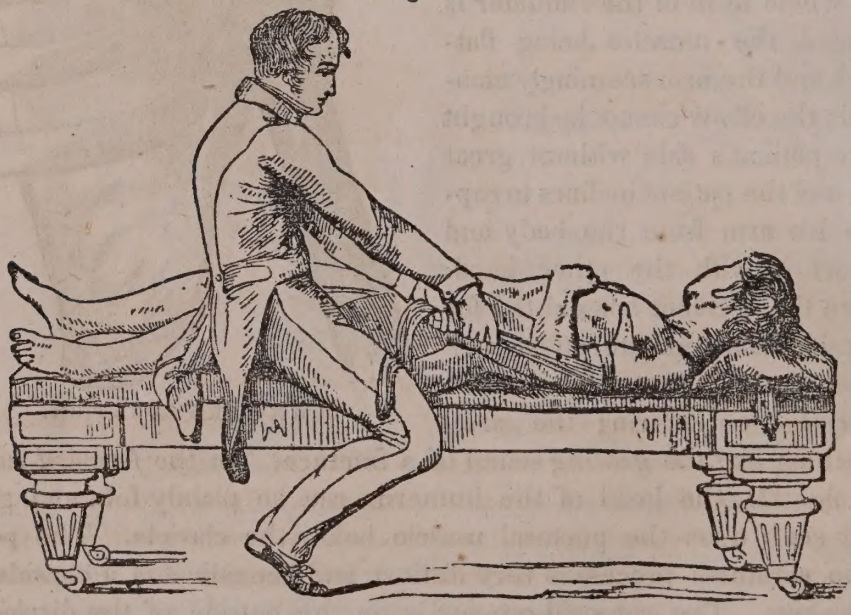
FORWARD LUXATION.

Fig. 222

BACKWARD LUXATION.

bone is apparent at first sight, and when the elbow is rotated it is seen to move. It may also be felt by applying the finger just below the

Fig. 223.

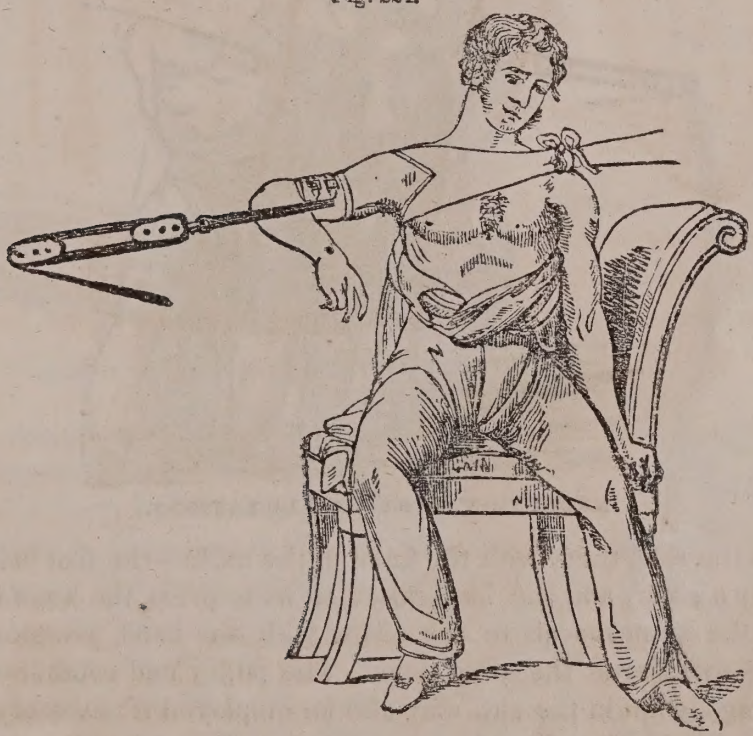


REDUCTION OF AXILLARY LUXATIONS.

spine of the scapula, and the change in the axis of the limb is quite obvious. This variety of dislocation is extremely rare.

Treatment.—The general plan of reducing luxations at the shoulder joint, adopted by modern surgeons, is represented in fig. 223. The patient is placed in a recumbent position, and the surgeon, sitting before him, puts his *unshod* heel on the head of the bone in the axilla, and presses it upward, while he pulls steadily and firmly on the arm until the head of the bone slips into the glenoid cavity. By this simple management, almost any person, although entirely ignorant of anatomy, may reduce nearly all the luxations that occur at this joint, by taking the case very soon after the accident. If greater force is required than one person can exert, he may be assisted by others pulling behind him, by means of additional straps or bandages placed upon the arm. If this plan fails, greater force can be brought to bear by the method represented in fig. 224. The patient is seated in a chair, and

Fig. 224.



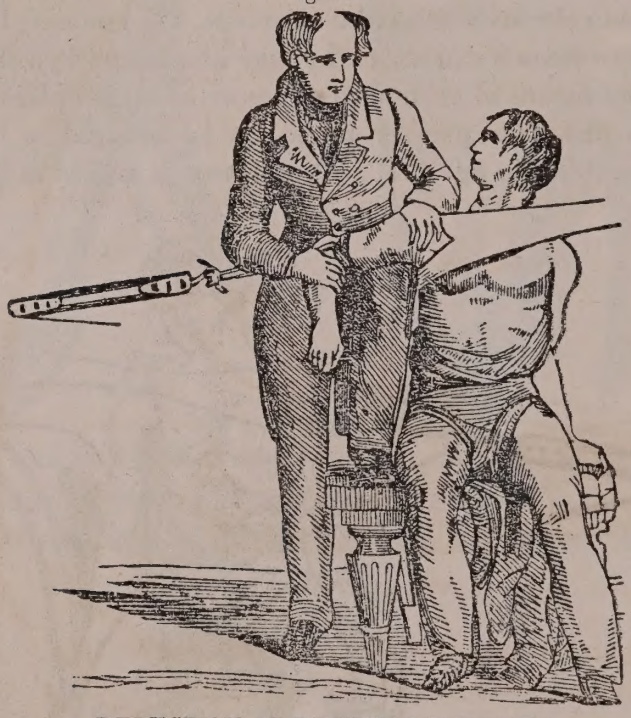
EXTENSION AND COUNTER-EXTENSION.

counter-extending bandages so applied as to let the arm pass through them. For the *extending* bandage, a wetted roller, placed around the arm above the elbow, with straps or slips of cloth attached, will answer. The arm is then raised so that the elbow is a little above the horizontal line with the shoulder, and, while in this position, two or more assistants make gradual and steady extension upon it, an equal amount

of force being employed in producing counter-extension at the same time. After the strain upon the muscles has been continued for some time, the surgeon, resting his foot on the chair, pushes his knee into the axilla and presses up the head of the bone, while he presses down on the acromion with one hand; making also slight rotation upon the arm.

There is another method by which a majority of *recent* dislocations can be easily replaced without waiting for the regular surgeon. Place the patient in a chair, fig. 225, extend the luxated arm as far as possi

Fig. 225.



REDUCTION OF RECENT LUXATIONS.

ble from the side, then, with the knee in the axilla—the foot being supported on a chair, and the heel raised so as to press the knee upward—grasp the humerus above the elbow with the hand, pressing down upon the shoulder at the same time. The pulley and counter-extending bandage, seen in the cut, may also be employed if necessary.

In the *forward luxation*, the extension is to be made obliquely downward and slightly backward. The resistance is usually stronger than in axillary dislocations; hence extension must be kept up somewhat longer. When the head of the bone is observed to move, the surgeon should place his knee or heel against it, and press it backward into its cavity. In other respects the management is the same as for the preceding variety.

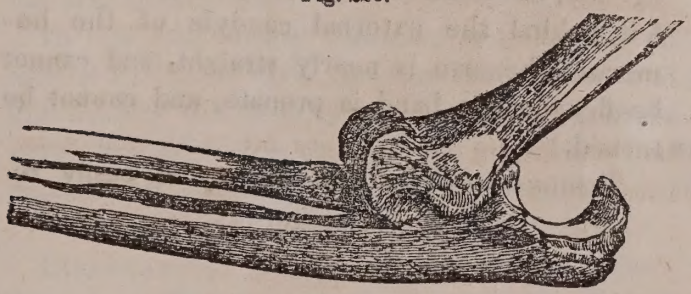
In the *backward luxation* the reduction is easy. After the shoulder is fixed, gradual extension is made directly outward, the head of the bone being thus moved slowly forward into the glenoid cavity. This dislocation has been replaced by merely raising the arm, and turning the hand to the back of the head.

After reduction, the arm should be carried in a sling for several days, and all motion at the joint prevented by suitable bandages.

Dislocations at the Elbow.—Injuries at this joint are very frequently complications of dislocation, fracture, and laceration. Surgeons distinguish five varieties of dislocation. *Both bones* of the forearm may be pushed *backward*, or to *one side*; the *radius* may be displaced forward; the *ulna* alone may slip *backward* over the condyle of the humerus; and the *radius* alone may slip from its connection *at* the elbow joint.

Symptoms.—When the *radius* and *ulna* are both dislocated *backward*,

Fig. 226.

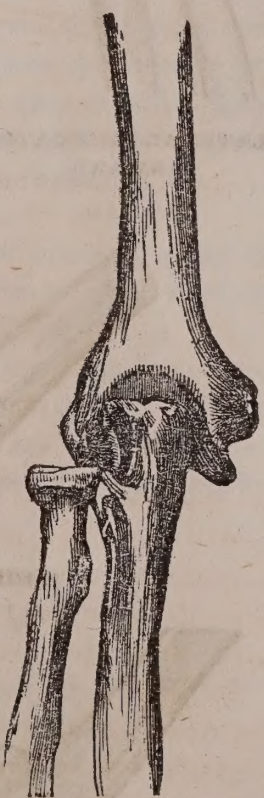


ELBOW LUXATION BACKWARD.

fig. 226, the posterior projection is very prominent. The olecranon process is above the external condyle, and a deep hollow may be felt on each side of it; while in front, under the tendons, the condyles appear like hard tumors. The hand and forearm are supine, and cannot be entirely turned.

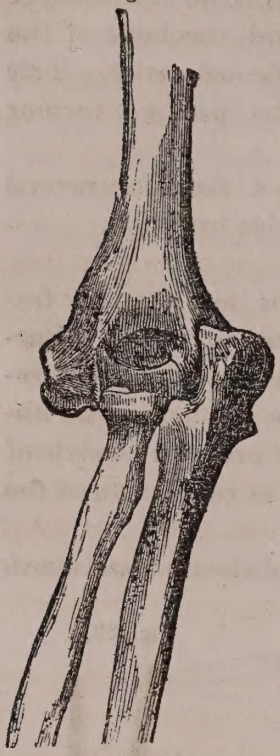
In the *lateral* dislocations of *both bones*, whether inward or outward, they are driven more or less *backward*. In the *outward* dislocation, fig. 227, the projection of the ulna is still greater; the coronoid process is fixed at the external condyle; and the flat head of the radius forms a projection outside and behind the elbow, with an abrupt cavity above it. In the *inward* luxation, fig. 228, the head of the ulna is displaced behind or over the internal condyle, projecting in

Fig. 227.



LATERAL DISLOCATION OUTWARD.

Fig. 228.



LATERAL DISLOCATION INWARD.

that direction, while the external condyle is made equally prominent on its side by the radius occuyping the place of the ulna.

When the *ulna* is dislocated *backward*, the olecranon can be easily felt behind the humerus; the arm cannot be straightened, nor can it be flexed to more than a right angle; the forearm and hand are also twisted inward.

In dislocations of the *radius forward*, fig. 229, the forearm is more or less bent, but in attempting to flex it further, it is suddenly stopped before it gets to a right angle; the elevated head of the radius bears against the fore part of the humerus, where, if a finger be pressed into the bend of the arm, it may be felt moving. The hand is also in a state of pronation.

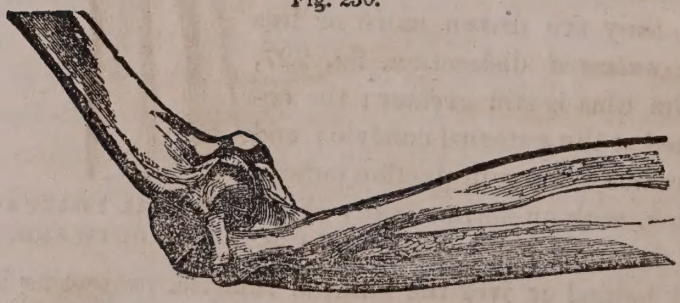
In the *backward* dislocation of the *radius*, fig. 230, the head of the bone may be seen and felt behind the external condyle of the humerus; the arm is nearly straight, and cannot be flexed; the hand is pronate, and cannot be turned.

Treatment.—The *first* variety is easily reduced. The surgeon places his knee on the inner side of the elbow, pressing chiefly on the displaced bones so as to keep them from bearing on the end of the hu-

Fig. 229.

FORWARD LUXATION OF THE RADIUS.

Fig. 230.



BACKWARD LUXATION OF THE RADIUS

nerus, and to bring the coronoid process out of the posterior fossa, so that it can pass over the condyles, while the arm is *bent* slowly and steadily with considerable force. This form of luxation can generally be reduced with the aid of suitable hot water relaxant processes, a long time after the accident.

The *second* variety is mainly reduced by bending the arm over the surgeon's knee, as in the preceding case; less pressure, however, is usually required, as the bones do not require the same separation from the humerus.

The *third* variety is replaced still more readily by the same general plan. Here the *bending* of the arm is the principal part of the operation, the fixed radius acting like a lever to push the humerus back into its place on the ulna.

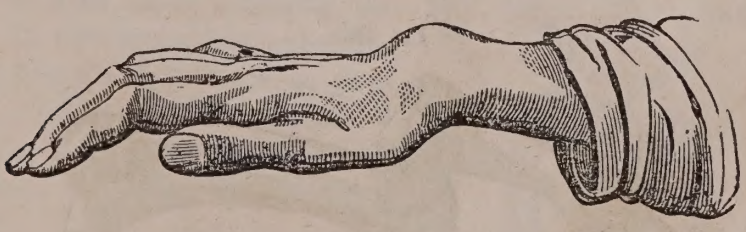
To reduce the *fourth* variety, the surgeon takes the patient's hand, as in "shaking hands," and makes steady extension, while his other hand is pressed strongly on the ulnar side of the head of the radius, pushing it *outward* and *upward*. It will facilitate the reduction to have the arm slightly bent.

In the *fifth* variety *extension* is to be made upon the radius, and *counter-extension* upon the humerus, while firm pressure is made on the head of the bone, until it slips into its place. One assistant may make the extension, another the counter-extension, and the surgeon make the pressure and direct the movements of the bone.

DISLOCATIONS AT THE WRIST.—Six varieties of luxation occur at this joint. The radius and ulna may together be displaced forward or backward, or either of them separately in either direction.

Symptoms.—When *both bones* are displaced *forward*, their projection is seen and felt *under* the carpus. This accident is caused by falling on the palm of the hand. When *both bones* are displaced *backward*, they project *over* the carpus; the carpal bones are thrown for-

Fig. 231.



BACKWARD LUXATION AT THE WRIST.

ward and upward under the flexor tendons, in front of the forearm. This luxation is represented in fig 231. These luxations may be dis-

tinguished from *sprains*, or *strains*, by the more sudden occurrence and more uneven appearance of the swelling.

When the *radius alone* is displaced, the *external* or *thumb* side of the hand is backward, and the opposite side inward or forward, the extremity of the radius may also be seen to form a prominence in the front of the wrist. When the *ulna alone* is detached, which more frequently happens, the connecting ligament is necessarily ruptured; the hand is twisted, the bone projects at its back, from where it may be easily pressed down; but when the pressure is removed, the deformity will reappear.

Treatment.—The process of reduction is similar when both bones are displaced either forward or backward. The surgeon holds the hand of the patient in one of his, and with the other supports the forearm, while an assistant holds the arm at the elbow, and keeps that joint slightly flexed. When sufficient extending and counter-extending force is applied, the bones are drawn into place by the contraction of the muscles. Compresses should then be placed upon the wrist, and secured by a roller which should inclose the limb from the tips of the fingers to the elbow; after which a splint should be added, and the forearm suspended in a sling. The same treatment precisely is required when the radius alone is dislocated. To reduce the dislocated ulna, it is only necessary to press the ulna down in its proper cavity at the side of the radius, and retain it there by compresses, bandages, and splints. The splints should be well padded, extend along the forearm in a line with the back of the hand, and be well secured with a roller.

Carpal and Metacarpal Dislocations.—Displacements of the bones of the wrist are extremely rare; but when they do occur, the hand is to be extended, and the bone pressed down into its place, and then secured by proper compresses and bandages.

Luxations may occur at any of the phalangeal joints, and the smaller bone may project over or under the larger, constituting the *posterior*

Fig. 232.

POSTERIOR PHALANGEAL LUXATION.

luxation, fig. 232, or the *anterior*, fig. 233 The nature of the accident will be readily distinguished at the first sight.

Treatment.—The general plan of reducing dislocated fingers and

Fig. 233.

ANTERIOR PHALANGEAL LUXATION.

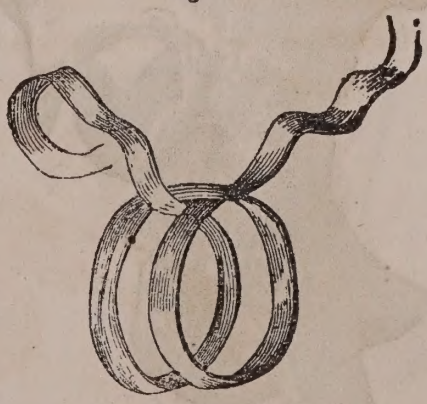
toes is as follows: The surgeon places his thumb at one of the divided extremities, and his finger at the other, fig. 234, then makes extension, while the joint is moderately flexed. The reduction will usually be

Fig. 234.

REDUCTION OF DISLOCATED FINGERS AND TOES.

easily affected; but if a long time has elapsed since the accident, the extension may require to be kept up perseveringly for a considerable length of time. In such cases, a piece of tape is usually employed; it is fixed to the finger by what is called the "clove-hitch," fig. 235, and to this the extending force is applied.

Fig. 235.



CLOVE-HITCH.

The thumb, which is seldom dislocated, is with more difficulty reduced. It requires great extending force, during which it should be flexed toward the palm of the hand. It should also be well covered with wet tape before the clove-hitch tape is applied.

DISLOCATIONS AT THE HIP-JOINT.—The head of the femur may be displaced *upward* on the dorsum of

the ilium, fig. 236, or *downward*, into the foramen ovale, fig. 237, or

Fig. 236.

UPWARD LUXATION.

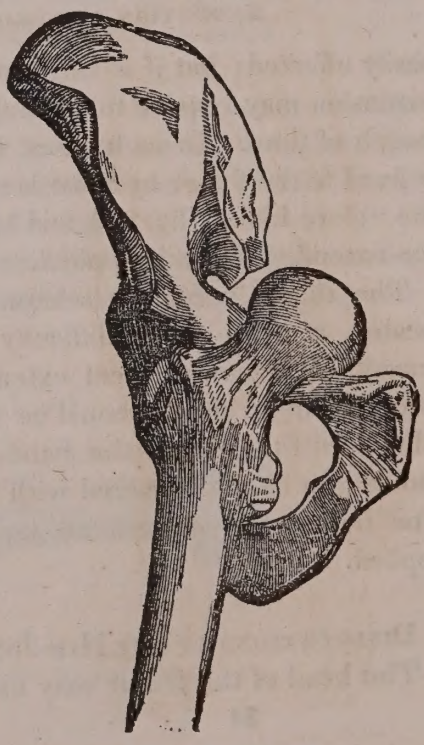
Fig. 237.

DOWNWARD LUXATION.

Fig. 238.

BACKWARD LUXATION

Fig. 239.



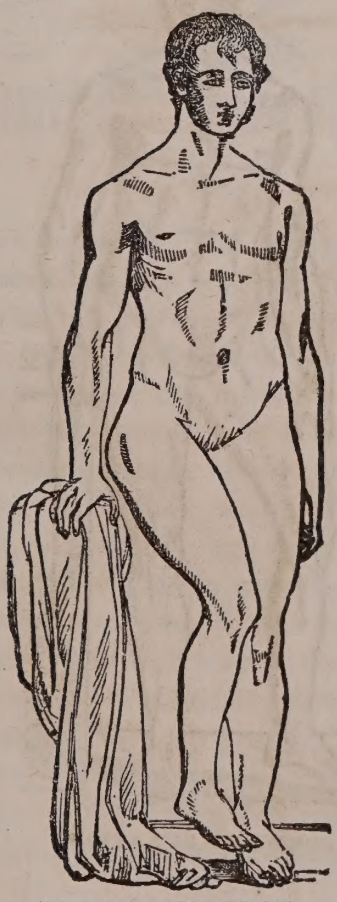
FORWARD LUXATION

backward, into the ischiatic notch, fig. 238, or *forward*, on to the pubes, fig. 239, in which case it is also thrown upward. The first variety is the most frequent, being the result of violence in an upward and outward direction.

Symptoms.—In the *first variety* the femur rests on the concave side of the pelvis; the limb is shortened from an inch and a half to two inches; the knee closely approximates, yet does not touch that of the other leg; the foot is turned inward; the thigh can be bent over the opposite one, and the round head of the bone can be felt moving upon the ilium. Fig. 240 represents the appearance of the limb while the patient is in the standing position.

In the *downward* dislocation, the head of the bone can be felt by examining the inside of the thigh, especially in thin persons; the leg of the affected side is about two inches longer than the other; the trochanter is less prominent than on the sound side; the body is bent forward; and when the patient stands erect, the knee projects in advance of its fellow, and is kept wide apart from it; the foot, though separated, is turned neither in nor out, fig. 241.

Fig. 240.



UPWARD LUXATION

Fig. 241.

DOWNWARD LUXATION

In the *backward* luxation, the head of the femur can rarely be felt the trochanter will be found further back than natural; the foot and knee are turned inward; the knee is slightly flexed and advanced forward; the heel is raised, and the ball of the great toe rests on the base of the other great toe, and the limb is shortened from half an inch to an inch, fig. 242.

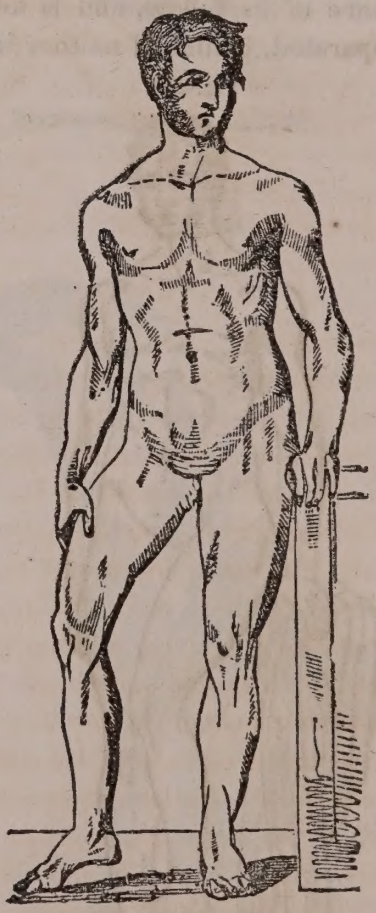
In the *forward* and *upward* luxation, the head of the bone is at once discovered in front, and a little above the level of Poupart's ligament, which circumstance distinguishes the case from a fracture of the neck of the femur; the limb is shortened from one to one and a half inches; the knee is everted; the foot and knee cannot be rotated inward, but the thigh can be flexed, bringing them forward. In the erect position this patient, fig. 243, contrasts strikingly with the preceding one.

Treatment.—As the muscles concerned in this articulation are large, and their resistance powerful, it is always prudent to relax the whole

Fig. 242.

BACKWARD LUXATION.

Fig. 243.

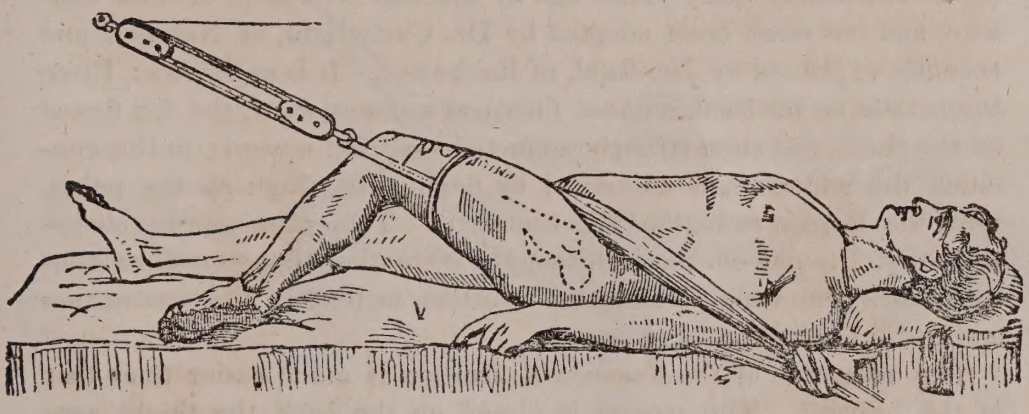


FORWARD LUXATION.

muscular system before attempting reduction. An admirable and very pleasant method of doing this is to envelop the patient in the warm wet-sheet pack, placing hot bottles to his feet and sides, and covering him well with bedding, the affected limb being sustained in an easy position by pillows; while in the pack the patient should drink abundantly of warm water, and after being sufficiently relaxed for the operation, he should be kept well covered in flannel blankets to retain the heat and moisture, and prolong the relaxation. All of these hip dislocations can frequently be reduced by the *rotary*, or "Sweet plan;" but surgeons have a specific and surer method for each variety.

In the *upward* displacement the patient is laid on a table, or placed

Fig. 244



REDUCTION OF UPWARD LUXATION.

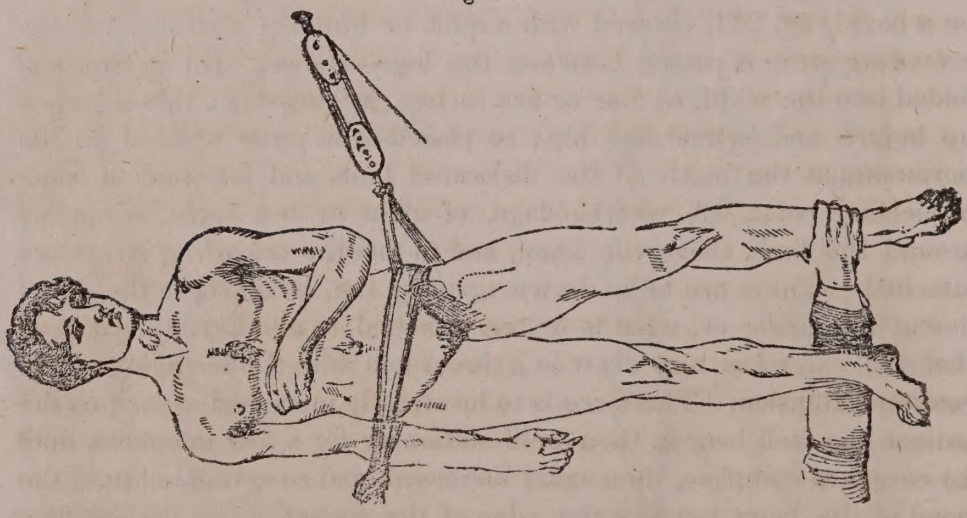
on a board, fig. 244, covered with a quilt or blanket; a strong *counter-extending* strap is passed between the legs—a sheet split in two, and folded into the width of four or five inches, will answer; this is passed up before and behind the hip; so placed as to press upward on the perineum, at the inside of the dislocated limb, and fastened to some unyielding point. A wet bandage, of eight or ten turns, is applied around the limb, above the knee, and to this the *extending* straps are attached. These are to be drawn upon by the assistants in the direct line of the limb; or, what is better, attached to a pulley, so stationed that the extension may draw in a direct line with the fastening of the counter-extension. The force is to be steadily increased as long as the patient can well bear it, then held stationary for a few moments, until he ceases to complain, then again increased, and so continued until the head of the bone reaches the edge of the socket, when the surgeon rotates the limb a little, and elevates the head until it enters the acetabulum. The *snapping* noise, as the head of the femur slips into its socket, when the extension is made by manual force, is not always

neard when the force is more steadily and gradually applied by the pulleys; hence it is sometimes necessary to ascertain the fact of its replacement by actual measurement; and until this point is settled the extension should not be abated. In some cases the head of the bone is held fast over the edge of the socket; to prevent this a towel or handkerchief may be placed round the thigh, as high up as possible, and the bone lifted by it at the proper moment.

The above is the plan approved and recommended by the best "standard authorities;" but, after all, it is probably neither the best method, nor founded on true mechanical nor physiological principles. A very different and much more easy plan for both surgeon and patient, which dispenses with the torture of traction entirely, was practiced successfully many years ago by the late N. Smith, of Yale College, and has since been adopted by Dr. Cartwright, of Natchez, and recently explained by Dr. Reid, of Rochester. It is as follows: Place the patient on his back, *without fastenings of any kind*, the leg flexed on the thigh, and then strongly adducted—carried inward; in this condition the adduction is continued by flexing the thigh on the pelvis, until the knee is as high as the umbilicus. This plan is predicated—correctly, I think—on the idea that the distention of the small muscles constitutes the main obstacle to reduction, instead of the contraction and resistance of the large ones.

The reduction of the *downward* luxation is much easier than that of the upward. The patient is placed on the back, the thighs sep-

Fig. 245.



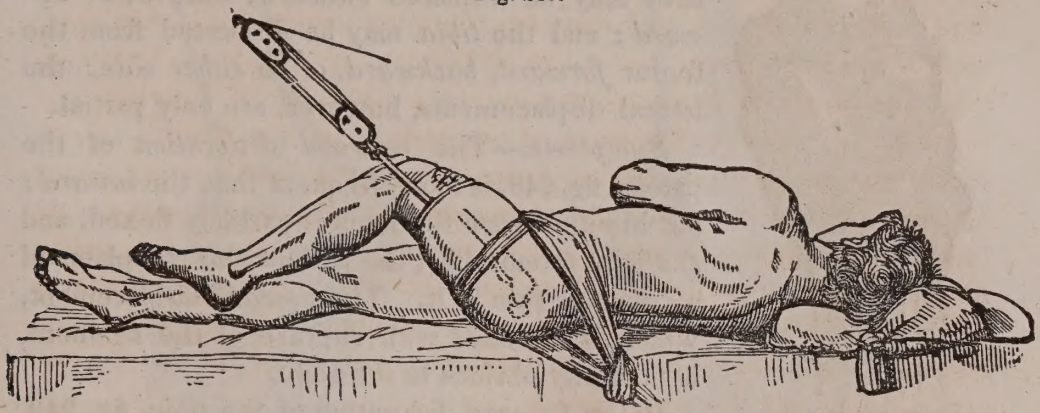
REDUCTION OF DOWNWARD LUXATION

arated, fig 245; a folded cloth is placed over the perineum, so that when the ends are drawn upon the force will bear against the inner

and back surface of the bone. Another strong band is passed transversely around the pelvis, above the acetabulum, the front end passing over the former strap, so as to give to it a more upward direction. The force is then applied, as in the former case, and as the head of the bone begins to rise, the surgeon passes his hand under the opposite leg, and, seizing the ankle of the affected one, brings it gently, yet firmly, toward the other; by all of which movements combined, it is brought into its socket

The third variety, dislocation *backward* into the *ischiatic notch*, is the most difficult of all to reduce. The patient is placed on his sound side

Fig. 246.

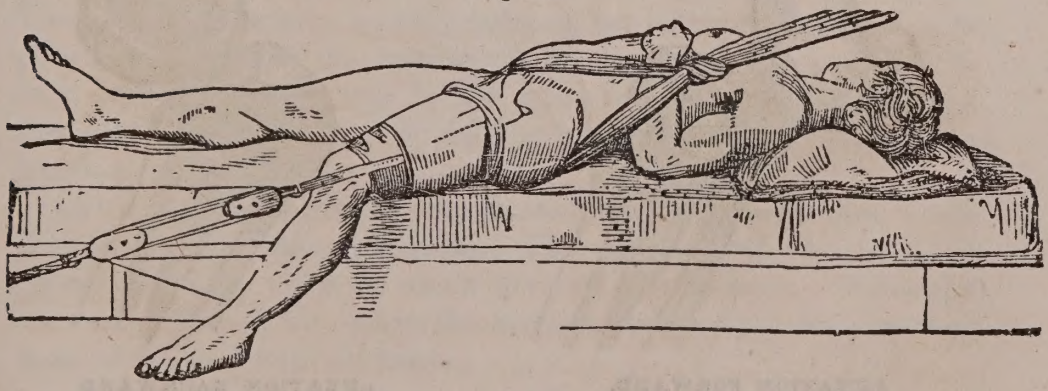


REDUCTION OF BACKWARD LUXATION.

on a board or table, fig. 246, with the affected thigh drawn over the middle of the other. *Extension* and *counter-extension* are made in the same way as in the first variety, with the addition of a strap around the upper part of the thigh, which is carried over the shoulders of an assistant, to raise the head of the bone at the commencement of the operation, out of the notch, or impart a lifting direction to the extending force. The surgeon may also press the trochanter forward with his hand.

In reducing the *forward and upward* luxation, the patient is placed

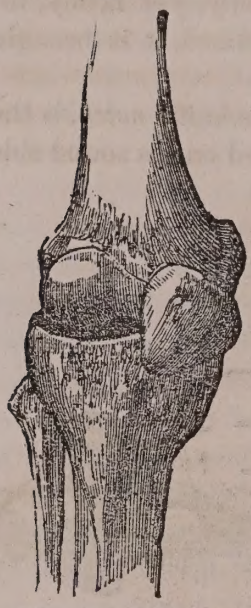
Fig. 247.



REDUCTION OF FORWARD LUXATION

on his sound side, the *counter-extending* force fixed somewhat in front of a line with the body, the point of extension being as much behind, fig. 247. The forces are intended to be so arranged as to draw the limb *backward* as well as *downward*. The lifting strap is to be employed as the extension progresses, an assistant pressing down on the pelvis, as the surgeon raises the head of the femur over the pubis and edge of the acetabulum.

Fig. 248.



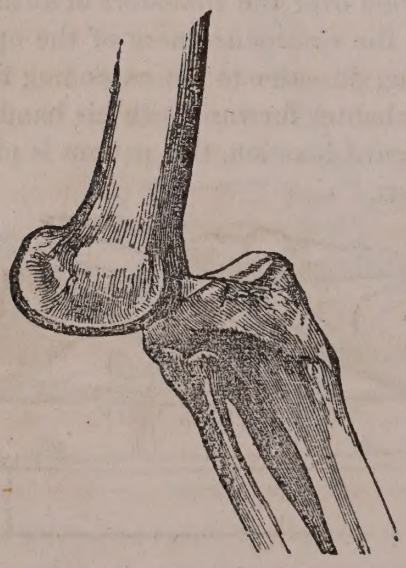
OUTWARD LUXATION OF PATELLA.

DISLOCATIONS AT THE KNEE-JOINT.—The *patella* may be displaced *outward*, *inward*, or *upward*; and the *tibia* may be dislocated from the femur *forward*, *backward*, or to *either side*; the lateral displacements, however, are only partial.

Symptoms.—The *outward dislocation* of the patella, fig. 248, is more frequent than the *inward*; but in either case the knee is partially flexed, and the joint immovable; the patient also complains of a sickening pain in it. The *upward* displacement, which is attended with rupture of the ligament, is perfectly obvious to the sight.

In the *forward* dislocation of the *tibia*, fig. 249, the head of the bone is seen and felt above the

Fig. 249.



LUXATION FORWARD.

Fig. 250.

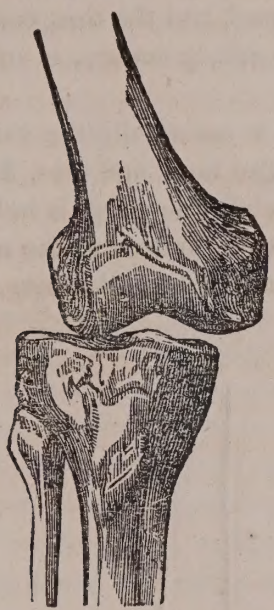
LUXATION BACKWARD

front of the condyles, these being perceived in the popliteal space. There is also numbness of the foot, from pressure on the nerves and popliteal artery.

In the *backward* luxation, fig. 250, the limb is sensibly bent, and somewhat shortened; the condyles project; and the flexure of the limb is backward instead of forward, the foot being drawn forward.

In the *lateral* displacements one condyle of the femur rests on the head of the tibia, where the other condyle belongs, the displaced one projecting externally or internally, as in fig. 251 and fig. 252.

Fig. 251.



LATERAL LUXATION EXTERNALLY.

Fig. 252.

LATERAL LUXATION INTERNALLY

Treatment.—To reduce the *outward* dislocation, the patient is placed in a recumbent posture, the limb raised by the heel, to relax the extensor muscles, and then the displaced bone is pressed down to its place, the force being applied to the edge most distant from the joint. The *upward* dislocation is easily reduced, but with difficulty kept in its place, on account of the rupture of the ligament. The *roller*, skillfully applied from the toes to the groin, will generally answer; and this may be assisted by a straight splint fastened under the whole length of the leg.

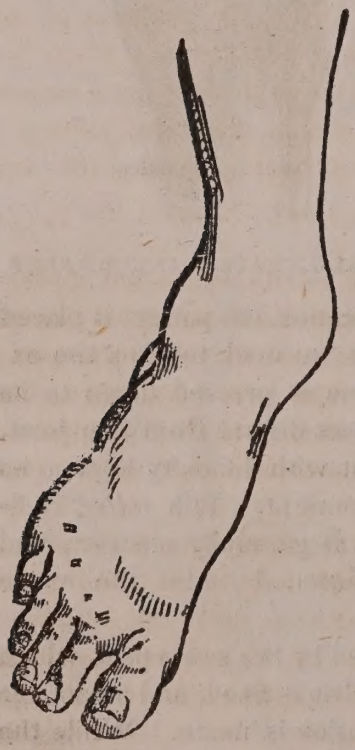
All the varieties of luxated tibia are reduced by the same plan, which is chiefly that of simple extension. The pelvis is fixed, and a bandage placed round the ankle by which the extension is made. While the assistant pulls upon the ankle, the surgeon presses upon the separated head of the bone with his hands.

Dislocations at the Ankle.—The ankle joint may be displaced *inward*, *outward*, *forward*, or *backward*. The accident is frequently complicated with fracture.

Symptoms.—In the *inward* dislocation, fig. 253, which is the most common, the foot is turned out, and a tumor is formed by the internal malleolus pressing strongly against the skin, which seems ready to burst; the joint, however, is still movable. A depression may generally be felt about three inches above the ankle, in which case the fibula is fractured. The *outward* dislocation is known by a corresponding deformity on the other side. In the *forward* dislocation, fig. 254, the foot is shortened, the heel elongated, and the toes point downward. The *backward* dislocation, which rarely occurs, is manifest to the sight.

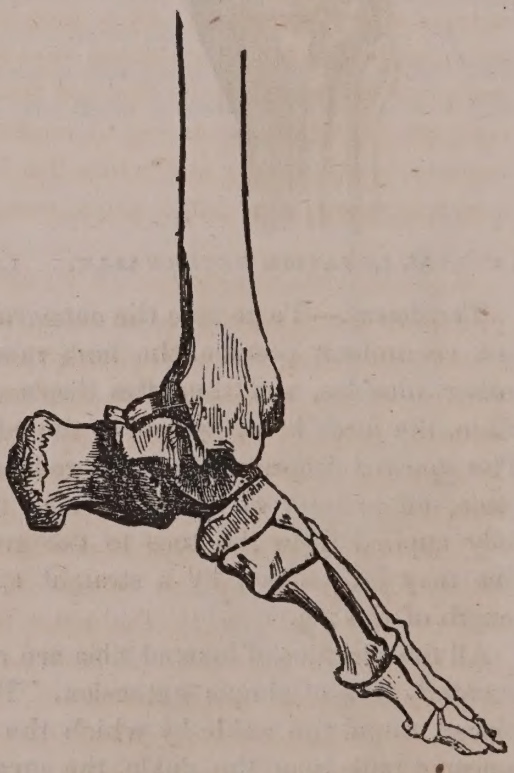
Treatment.—The manner of reduction is essentially the same in all cases. An assistant, holding the foot by the heel and toes, flexes the leg to a right angle with the thigh, and, while the thigh is held fast by another assistant, just above the knee, makes extension at the ankle, the surgeon at the same time pushing the end of the tibia into its place.

Fig. 253.



INWARD LUXATION.

Fig. 254.



FORWARD LUXATION

Splints and bandages are necessary, and wet cloths must be frequently applied, as there is usually considerable inflammation.

Dislocations of the Foot.—When the tarsal or metatarsal bones are displaced, the nature of the injury is obvious. Reduction is effected by extending the foot and pressing upon the displaced bone at the same time. Compresses and bandages are necessary.

Dislocations of the toes are managed precisely in the same way as dislocated fingers.

CHAPTER X.

FRACTURES.

Technology.—A fracture is called *transverse* when the bone is broken directly across; *longitudinal* when it is split lengthwise; and *oblique* when broken in other directions. When the fracture is not accompanied with an external wound, it is called *simple;* when the soft parts are so lacerated that the fractured bones protrude, it is termed *compound;* when occurring in connection with a dislocated joint, it is termed *complicated;* and when the fractured bone is divided into several fragments, it is called *comminuted.*

General Management of Fractures.—Although a few general principles are applicable to all cases, so great is the diversity of circumstances attending these accidents, that much must be left to the sound judgment and mechanical skill of the operator. A great variety of splints, bandages, and other apparatus have been invented, all intended to keep the injured parts in contact until the broken parts of the bone unite.

The process of re-union is as follows: Coagulable lymph, fibrin, and blood, thrown out by the vessels of the part, form a material which slightly glues, as it were, the bones together soon after the injury; in the next place, a *provisional cartilage* is formed around the parts like a capsule, firmly supporting them; this gradually hardens, by ossific deposits, into a bony ring, called the *provisional callus*, which binds the parts still more firmly together. After this the proper substance of the bone is formed, the ossific process going on for several months or a

year; and when it is completed, the provisional support is removed by absorption.

The period at which the reparative process commences and terminates, varies with the structure of the bone, age, and habits of the individual, etc. The provisional union ordinarily begins between the *sixth* and *tenth* day, and is completed in *four* to *six* weeks. The sooner, however, that fractures are adjusted, the better; and about the *sixth* or *seventh* day, when the "knitting" may be expected to commence, the part should be examined and accurately adjusted, if need be; after which it only requires to be kept quiet. Great care must be taken to have the part easy and quiet from the *sixth* to the *twelfth* day —in old persons for eight or ten days longer—after which slight motion may be allowed. The symptoms of the provisional ossification, "knitting of the bone," are *itching* and *prickling* sensations in the part.

Fractures of the Cranium.—Any of the bones of the skull may be *crushed*, the fracture extending in different directions from a central point; or *cracked* through one or both plates in a straight line. The skull bone may also be bent without being fractured. In the case of fracture, a *crepitus* can be felt through the skin; and if any portion of bone is driven in upon the brain, symptoms of *compression* will be present.

Treatment.—All the constitutional and local measures heretofore recommended for compression must be employed in conjunction with the appropriate treatment for any degree of inflammation that may attend. But if the symptoms of compression continue after the inflammation has subsided, the depressed bone must be elevated by trephining, which should only be attempted by a skillful anatomist.

Fractures of the Nose.—These accidents, though occasionally severe, are not usually dangerous, and their nature is apparent from the resulting deformity. They can be adjusted by pushing out the depressed bone by a silver catheter, or some similar instrument, introduced within the nostril, while the fingers support them on the outside.

Fig. 255.

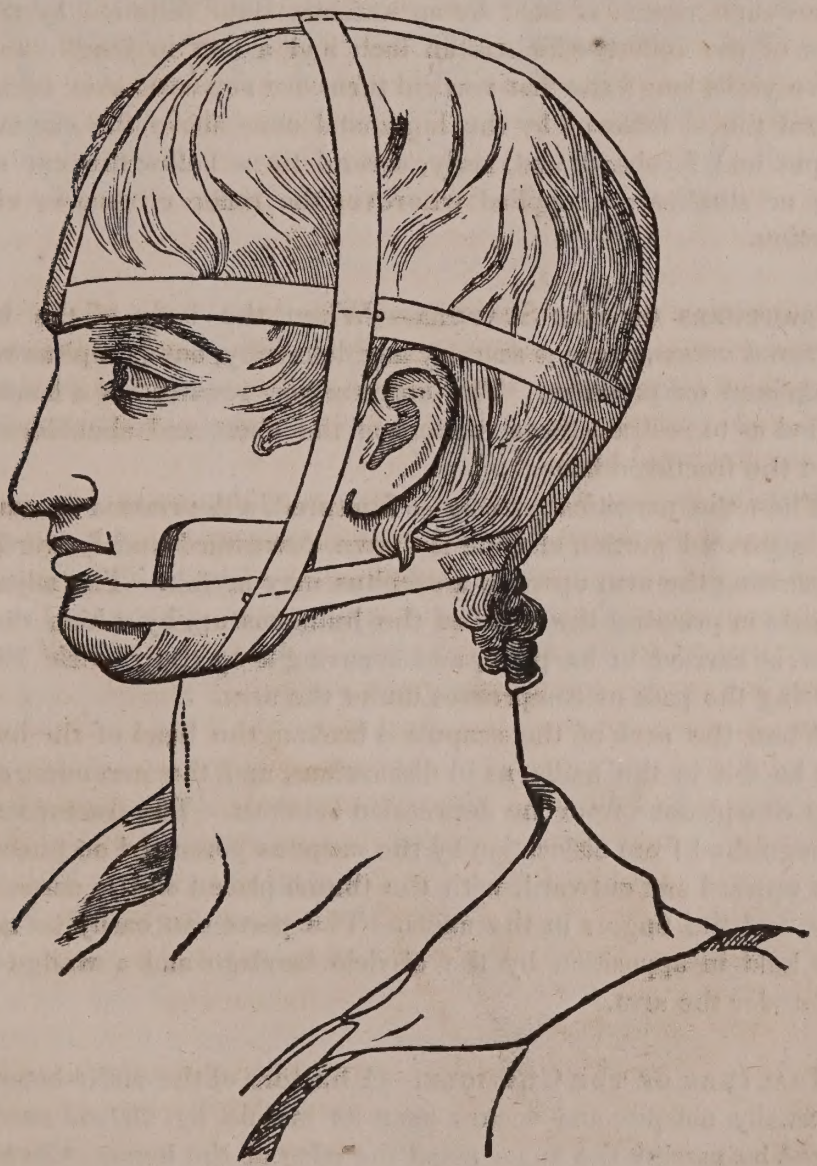
FRACTURE OF THE LOWER JAW

Fracture of the Lower Jaw.—The accident commonly occurs at the middle of the chin, fig. 255, although it may take

place in any part. The crepitus felt on moving the bone will determine the exact locality of the fracture; a depression may also be felt at the place.

Treatment.—The adjustment is effected by elevating or depressing until all the teeth are arranged properly with respect to each other and to those of the upper jaw. Should one of the condyles be displaced at the same time, it must be *reduced* previously to *setting* the broken bone. The jaw must be secured—the mouth being kept shut—by means of a strip of adhesive plaster, two and a half inches wide ex-

Fig. 256.



ADJUSTMENT OF FRACTURED LOWER JAW.

tending from ear to ear over the chin. The plaster should be spread on fine leather, as calf-skin; and over this a bandage of strong muslin, two yards long and two and a half inches wide, split from each end to within six inches of the middle, is to be applied. A hole is made in the center for the chin; the two lower ends are brought up over the top of the head, and the two upper ends are carried horizontally round to the back of the neck; several turns with each pair are then made, over and around the head, where they are fastened at their ends and also at each crossing. In the absence of adhesive plaster the compress and roller, fig. 256, will answer all purposes. The compress under each ramus is held by an assistant until fastened by the first turns of the roller, which is an inch and a half in length and four or five yards long; the first vertical turns are repeated over each other several times, followed by the horizontal ones above the ear over the occiput and forehead, and, lastly, several turns below the ear and lip. Pins or stitches are applied wherever the roller crosses or changes direction.

FRACTURES OF THE SCAPULA.—When the body of the bone is *fractured across*, there is scarcely any deformity, but a crepitus is easily recognized on pressure. The only surgery required is a bandage so applied as to restrain those motions of the chest and shoulders which affect the fractured bone.

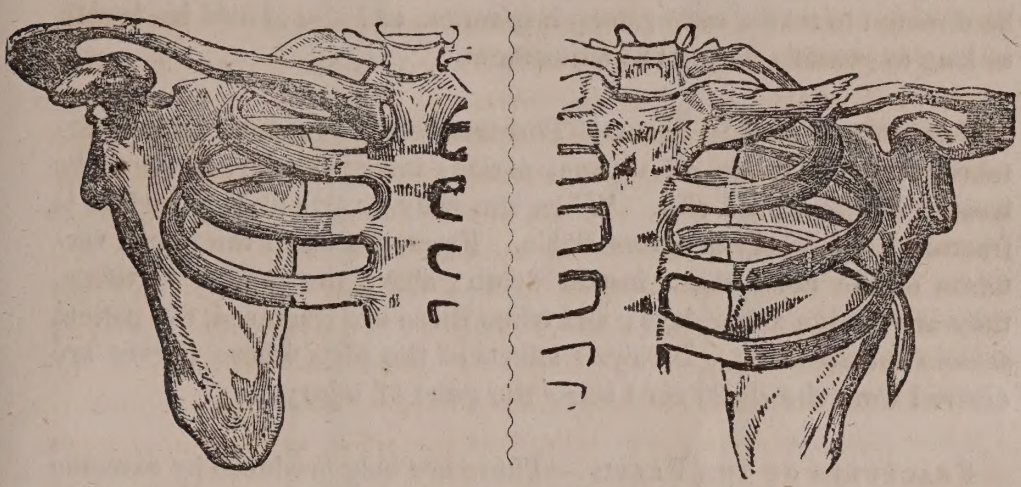
When the *acromion process* is fractured, a depression is manifest; the separated portion of bone is drawn downward and forward; and, on pressing the arm upward, a crepitus may be felt. The adjustment consists in pressing the head of the humerus up, by which the fragment is carried to its place, and securing it by the clavicle bandage, *omitting* the pads or compresses under the arm.

When the *neck* of the scapula is broken, the head of the humerus can be felt in the axilla, as in dislocations, and the acromion appears very conspicuous from the depression beneath. The fracture may be distinguished from dislocation by the crepitus perceived on pushing the arm upward and outward, with the thumb placed on the coracoid process, and the fingers in the axilla. The parts can easily be replaced and held in apposition by the clavicle bandage and a wedge-shaped pad under the arm.

FRACTURE OF THE CLAVICLE.—A fracture of the collar-bone, which is usually oblique, and occurs near its middle, fig. 257, is readily detected by passing the finger along the edge of the bone. Crepitus occurs on moving the shoulder.

The adjustment and dressing are essentially the same as in the case of a dislocated clavicle at its scapular extremity. The surgeon, placing

Fig. 257.



FRACTURED CLAVICLE.

his knee between the shoulders, draws them both back until the parts of the broken bone come into their proper position, and, while the shoulders are kept back and the arms down, by suitable apparatus, or the hands of assistants, the bandage is applied.

Fracture of the Sternum.—The breast-bone is never broken, except by great force directly applied. The accident is manifested by a depression at the injured point, and pain and crepitus which attend the movements of the thorax in respiration. Its adjustment requires the roller around the chest, so applied as to stop all motion; the respiration being carried on *wholly* by the abdominal muscles.

Fracture of the Ribs.—The ribs may be fractured at their vertebral or sternal extremity. The former case is frequently accompanied with dislocation. The latter, though generally called "dislocation of the cartilage," is really a *rupture*, and a rupture is much more like a fracture than a dislocation. A depression and crepitus may be detected by passing the finger along the rib. If the cartilage is torn from the rib, this bone will project.

Treatment.—In a majority of cases a broad roller, applied around the chest so firmly as to prevent all motion of the intercostal muscles, will be sufficient. When a rib projects, the compress must be applied; and tapes, carried over the shoulder and fastened to the roller, near the spine and sternum, are necessary to prevent it from slipping

down. In extensive or complicated fractures, stiff adhesive plaster, or even gum-shellac cloth, or wetted pasteboard, fitted to the part, are useful additions. Preceding the operation of pressing the bones or cartilages down to their proper position, the patient should in all cases be directed to take a rather deep inspiration, and also to hold his breath as long as possible during the adjustment.

Fractures of the Spine.—The transverse processes of the vertebræ may be broken off without serious inconvenience, and may be treated like fractured ribs. When the body or articulating surface is fractured, the injury is irremediable. Fractures about the fourth vertebræ of the neck cause instant death; above the lumbar vertebræ, they are fatal in a few days; and when these are fractured, the patient seldom survives long. Paralysis affects all the parts whose nerves are derived from the spinal cord *below* the point of injury.

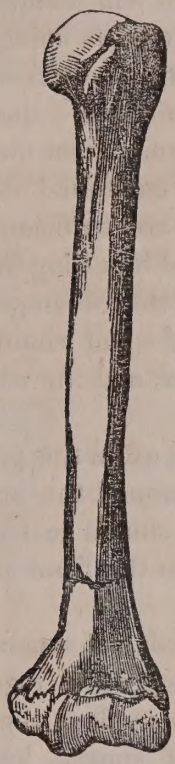
Fractures of the Pelvis.—These are only produced by extreme violence, of a *crushing* kind. They are always dangerous. The patient should be placed in an easy horizontal position, and handled as little as possible. The nature of the injury will aid the diagnosis as to the particular point of fracture; and generally crepitus can be felt by placing the hand on the crest of the ilium, while motion is made at the spine or lower extremities. A roller around the pelvis, with a strap under the nates, and attached to a pulley over the bed, so that the pelvis can be raised without effort on the part of the patient, constitute the principal surgery.

Fractures of the Humerus.—This bone is usually fractured near its middle, but may be broken near either extremity; when fractured near the neck, the injury is not easily distinguished from dislocation.

Symptoms.—A fracture in any part of the *shaft*, as in fig. 258, may be detected by the obvious deformity; the parts of the bone are drawn out of line; the patient experiences pain at the injured point; he is unable to move the limb; and a crepitus can be noticed by rotating the lower portion of the arm, while the upper part is fixed. The direction and extent of the fracture may be ascertained by tracing from the condyles upward with the finger.

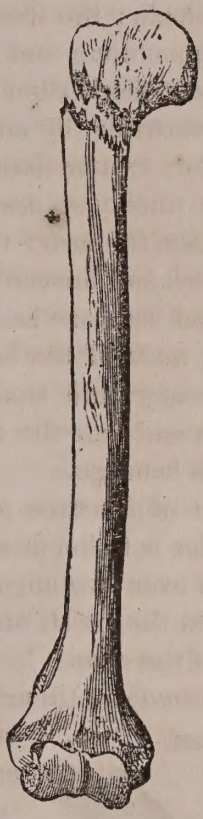
Fracture of the *neck*, fig. 259, seldom occurs except in old persons. By rotating the arm below the elbow, a crepitus will be felt. The roundness of the shoulder is not diminished, as in dislocation.

Fig. 258.



FRACTURED SHAFT.

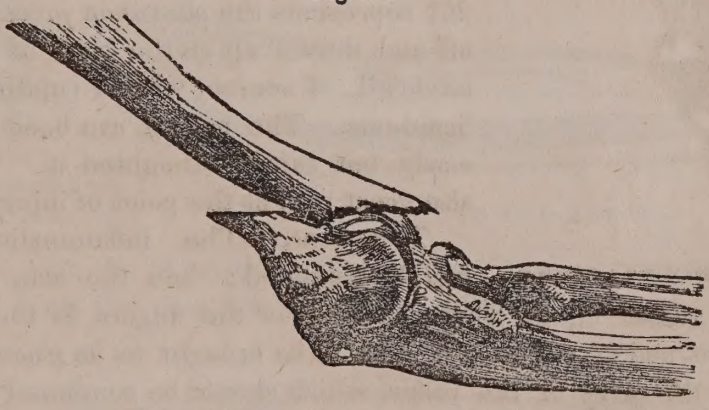
Fig. 259.



FRACTURED NECK.

Fractures near the *condyles*, fig. 260, are liable to be mistaken for dislocation of the forearm. When the fracture is *above* the condyles,

Fig. 260.



FRACTURE ABOVE THE CONDYLES.

the arm will be shortened; and in all cases the grating of the broken pieces can be felt; the motions of the elbow are but little impeded in fracture, which is not the case in dislocation.

Treatment.—When the *shaft* has been broken, sufficient extension must first be made; the fractured arm is next to be accurately adjusted, so that the appearance and length of the limb will compare well with its fellow; the roller is then to be applied—the parts being held in juxtaposition, meanwhile, by an assistant—rather loosely from the elbow to the shoulder; two or four splints—four are better—about a quarter of an inch in thickness, are then placed at convenient distances, so as nearly to inclose the arm; the roller is then continued down over the splints, and back and forward, until the splints are sufficiently secured; the forearm and hand are lastly to be suspended in a sling from the neck.

When the *neck* of the bone is broken, a wedge-shaped pad in the axilla is necessary; the shellac or pasteboard splint should be applied on the outside and over the top of the shoulder, and the whole fastened by the clavicle bandage.

In the case of fracture *above the condyles*, after the proper adjustment, the roller is to be first applied loosely around the arm and forearm, and then over two angular splints, which should reach nearly from the shoulder to the wrist, one being applied on the front and the other on the back of the arm.

When the *condyles* themselves are fractured, the separated portions of bone are to be pressed together, and a splint or cloth cap applied, reaching to the wrist, preceded, of course, by the roller. Some degree of deformity will always exist after these injuries.

Fig. 261.

OLECRANON FRACTURE

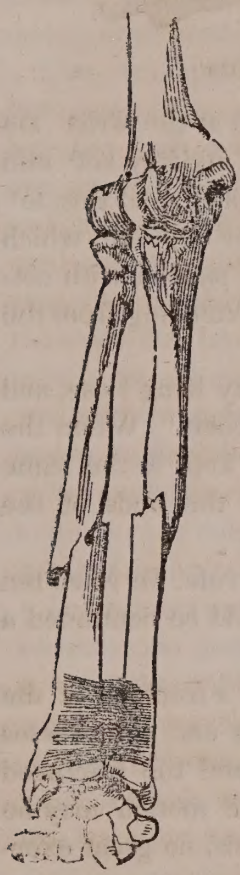
Fractures at the Elbow Joint.—Fig. 261 represents the *olecranon process* broken off and drawn up on the back of the arm, attended, of course, with a rupture of the ligaments. The patient can bend the arm easily, but cannot straighten it. There is also great pain at the point of injury.

Treatment.—The inflammation must first be subdued; then the arm is to be bandaged rather tightly from the ends of the fingers to the elbow; the broken end of the bone is next to be brought to its place, and included in the turns of the roller, which should be continued half way up the arm; the roller is then turned back and passed above, and the elbow joint about a dozen times in the form of the figure 8; after it is continued upward, including the whole arm. Lastly, a strong splint is to be placed in front of the joint over the bandage to prevent flexion

The coronoid process is sometimes fractured separately, attended necessarily with a backward luxation. It impedes the bending of the elbow. Its adjustment only requires the flexure of the forearm, and its retention in that position by proper bandages and splints. This fracture, and also the two preceding, unite by a ligamentous, instead of bony connection.

FRACTURES OF THE FOREARM.—Both bones may be fractured together, or either of them singly. Fig. 262 represents a fracture of *both bones*, with a view of the interosseous muscles, whose contraction tends to draw the bones together, so as to prevent the circular movement of the radius round the ulna.

Fig. 262.

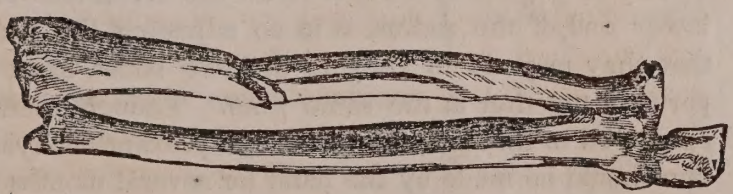


FRACTURE OF THE ULNA AND RADIUS.

When the *radius* alone is fractured, fig. 263, the depression and crepitus readily points out the place of injury; and the same symptoms on the opposite side of the arm denote a fractured *ulna*, fig. 264. The surgeon, in all these accidents, has only to trace the bones up from the wrist, until the finger comes to the divided part, when a depression will be felt; and by fixing the elbow, and rotating the wrist, the crepitus will be experienced.

The *lower end of the radius* is sometimes fractured near the wrist, where the hand is distorted, and appears very much like a dislocation, fig. 265;

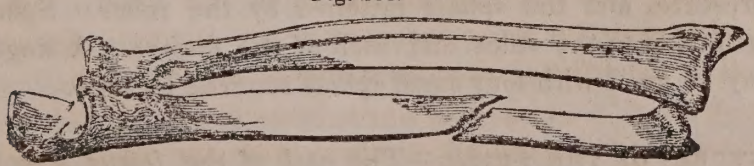
Fig. 263.



FRACTURE OF THE RADIUS.

but, on moving the hand, the styloid process of the radius moves with it, which is not the case when the bone is dislocated.

Fig. 264.



FRACTURE OF THE ULNA.

Treatment.—In the first variety—*fracture of both bones*—the most important point in the treatment is to keep the bones apart. After ad-

Fig. 265.

FRACTURE OF LOWER END OF THE RADIUS

justing the bones, by making the necessary extension at the wrist the arm should be bent at a right angle, with the thumb midway between pronation and supination; the loose roller is to be applied, and this, followed by two splints, one on the inside, and the other opposite, which should be convex on the side next the arm, and well padded with cotton; the splints are, lastly, to be secured by a roller extending from the hand to the elbow.

When the *radius* alone is fractured the hand may hang loose, and thus exert some degree of extending force on the bone. When the *ulna* alone is broken the hand and forearm should be kept in the same line, and the splint and bandage should extend to the ends of the fingers.

The splints should in all these cases, as a general rule, be worn ten or twelve days; but the compress and bandage should be continued a week or two longer.

The only point of difference in the treatment of a fracture at the lower end of the radius, is in so adjusting the pads and compresses that they may aid in keeping the two bones apart and the fractured portions together at the same time. Though passive motion may be employed in three or four weeks to prevent anchylosis, no great exertion should be made by the hand for several months.

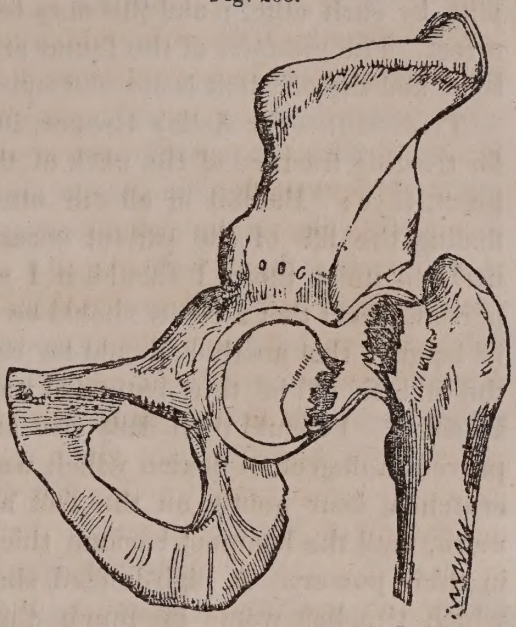
Fractures of the Wrist, Hand, and Fingers.—These accidents require a broad splint fitted to the front of the wrist and hand, with the ends slit for the fingers, the parts being well padded to secure equal pressure, and the splints fastened by the roller. Splints may also be adjusted to the sides and back of the fingers. A single finger bone may be fixed with four small splints secured by tape.

Fractures of the Thigh.—The *neck* of the *femur* may be fractured *within* or *without the capsular ligament*; the *trochanter maj-*

may be broken obliquely; and the *shaft* at or near the *trochanters*, in its *middle*, or near the *condyles*.

Symptoms.—The fracture *within* the ligament, as represented in fig. 266, generally unites by a ligamentous substance, or a double joint is formed, and the limb permanently shortened.

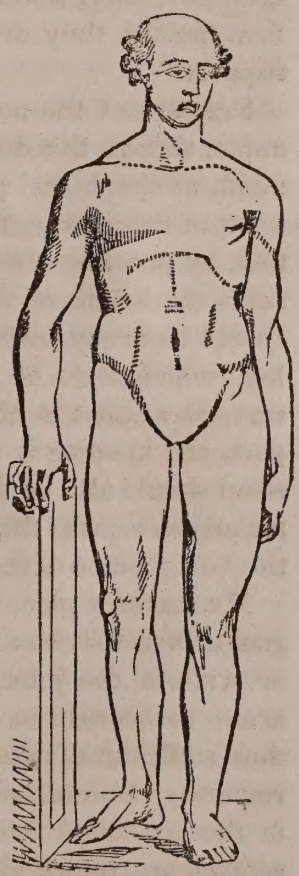
Fig. 266.



FRACTURE WITHIN THE CAPSULE.

The accident is known by the inability to stand on the leg, the limb being shortened one or two inches, the knee and foot turned out, and the heel inclining to rest on the other limb above and behind the malleolus, fig. 267. Severe pain is felt on moving the limb, and a crepitus will be recognized on rotating it. Sometimes, however, the shortening of the limb does not occur until several hours after the accident; and in some rare cases it is said the foot *turns in* instead of being everted.

Fig. 267.



FRACTURED NECK OF THE FEMUR.

In fracture *outside* the ligament, the pain and swelling are greater—often extreme; the limb is not materially shortened nor everted, and crepitus is more easily felt.

When the bone is fractured *obliquely* through the *trochanter major*, the leg is everted, a little shortened, and a fissure can be felt between the shaft and trochanter.

When the *shaft* is broken just *below* or *near* the *trochanters*, the psoas and internal iliac muscles draw the superior fragment of bone upward and forward, causing great pain and deformity.

When the *shaft* is broken *between* the *trochanters* and *condyles*, the deformity, crepitus on extension or rotation, and inability to bear weight upon the limb, determine the nature of the case. If the fracture be *oblique*, the limb will be much shortened by the broken parts slip-

ping by each other; and this *may* be the case also in *transverse* fractures. The *condyles* of the femur are seldom broken except in old persons, and the accident is not unfrequently fatal.

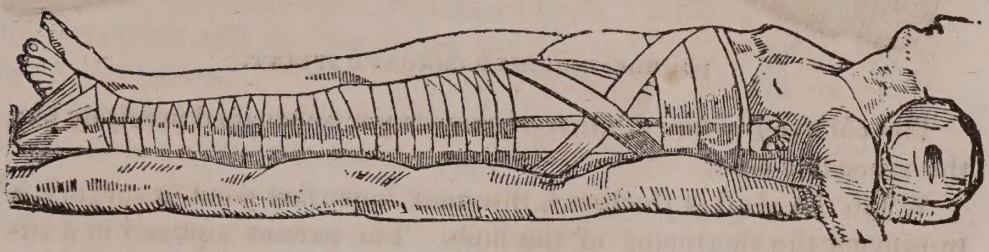
Treatment.—Sir Astley Cooper, in speaking of the various methods for treating fracture of the neck of the femur *within* the capsular ligament, says: "Baffled in all our attempts at curing these cases, and finding the life of the patient occasionally sacrificed under the trials made to unite them, I should, if I sustained this accident in my own person, direct that a pillow should be placed under the limb throughout its length; that another should be rolled up under the knee, and that the limb should be thus extended until the pain and inflammation had subsided. I should then daily rise and sit in a high chair, in order to prevent a degree of flexion which would be painful; and, walking with crutches, bear gently on the foot at first, then gradually more and more, until the ligament became thickened, and the muscles increased in their power. A high-heeled shoe should be next employed, by which the halt would be much diminished. Our hospital patients, treated after this manner, are allowed in a few weeks to walk with crutches; after a time a stick is substituted for the crutches; and in a few months they are able to use the limb without any adventitious support."

Fracture of the neck *outside* the capsular ligament, admits of ossific union, though this does not always result. Sir Astley's plan of adjustment, as simple and practical as any, is thus described: "In the treatment of this injury, the principles are to keep the bones in approximation, by pressing the trochanter toward the acetabulum, and to preserve the length of the limb. The foot and ankle of the injured side should be firmly bound with a roller to the foot and ankle of the other leg [which is to be kept straight], and thus the uninjured side will serve as a splint to that which is fractured, giving it a continued support, and keeping it extended to the proper length. A broad leather strap should also be buckled around the pelvis, including the trochanter major, to press the fractured portions of the bone firmly together; and the best position of the limb is to keep it in a straight line with the body."

Mr. Liston's plan, applicable to all cases, as detailed in his own language, is as follows: "Whether the fracture is suspected to be within or without the joint, either entirely or partially, the broken surfaces are to be brought in contact and retained immovably in apposition for a time sufficient to admit of union. The limb is put up in apparatus not requiring removal, and but little adjustment. This can be effected only in the extended position. Many splints, with foot-boards, straps, and screws, are intended for this purpose, some to be attached to the in-

jured limb, others to the sound one; but the apparatus which is most simple, easily to be procured *at all times and in all circumstances*, is at once the best and most efficient. This is a straight wooden board, not so thick as to feel cumbrous, and not so thin as to be pliable or easily broken; in breadth, corresponding to the dimensions of the limb; in length, sufficient to extend from two, three, or four inches beyond the heel, to near the axilla; deeply notched at two places at its lower end, and perforated by two holes at the upper. The splint, well padded, is applied to the extended limb, the ankles being protected by proper adjustment of the pads. The apparatus is retained by bandaging, fig. 268, a common roller is applied round the limb, from the toes to near the knee, so as to prevent infiltration, which would otherwise follow

Fig. 268.



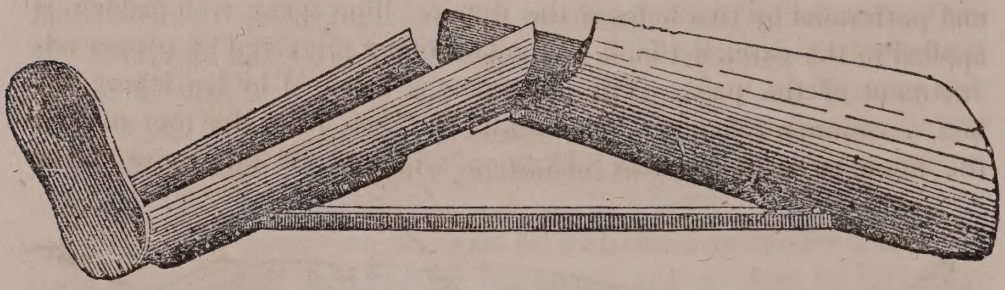
ADJUSTMENT OF FRACTURED NECK OF THE FEMUR.

pressure above by the rest of the apparatus. The splint is then attached to the rest of the limb by involving both in a roller from the foot to above the knee; and, in doing this, the bandage, after having been turned round the ankle, should be passed through the notches, so as to be firmly attached to the end of the splint, thereby preventing the foot from shifting. A broad bandage is applied round the pelvis, over the groin and down the thigh, investing all that part of the limb left uncovered by the previous bandaging. A broad band, like a riding-belt, is fastened round the pelvis, so as to bind the splint to the trunk, and thereby keep the broken surfaces of the bone in contact. A large handkerchief or shawl is brought under the perineum, and its ends secured through the openings at the top of the board. It is evident that the splint, being thus securely fixed, and made as part of the limb, tightening of the perineal band will extend the member and preserve it of its proper length. By care and attention in applying the apparatus, and in adjusting the cushions about the ankle and perineum, there is little or no risk of the skin giving way. The bandages will require to be reapplied once or twice during the cure; and the perineal band should be tightened frequently. The apparatus is retained for six or eight weeks, the time necessary for union varying according to circumstances. After its removal, great care must be taken at first in moving the

limb and putting weight upon it; it should be accustomed to its former functions very gradually."

Another convenient mode of fixing the thigh bone, is the concave double-inclined splint, recommended by Dr. Beach, with the foot-board added by Dr. Hill, fig. 269. The manner of using it must be obvious at a glance.

Fig. 269.



DOUBLE-INCLINED CONCAVE SPLINT.

The *oblique fracture of the trochanter major* is managed precisely like the preceding case.

When the *shaft* is *fractured*, the most important point in surgery is to prevent the shortening of the limb. The patient is placed in a *sitting* position, by which the psoas and iliacus muscles are relaxed, and the ends of the bones approximated. Extension is then made until the two limbs correspond; the roller is next applied, from the toes to the hip; three splints are then placed over the first bandage; one in front from the patella to the pelvis; one from external condyle to the trochanter major; and one from the internal condyle to the perineum. Dr. Hill—I think judiciously, too—recommends a *fourth* splint of stout gum-shellac cloth to be applied on the inferior surface, from the tuberosity of the ischium to the hollow of the knee, wide enough to cover one third of the thigh, and perfectly adapted to the surface. All the splints are to be firmly fastened with a roller, when the limb should be placed on the inclined splint, or supported by some similar apparatus. Three separate rollers are commonly employed; the first is so applied about the knee as to admit of its being bent. The patient should not lie down for ten or twelve days, as that posture is exceedingly liable to displace the broken bones.

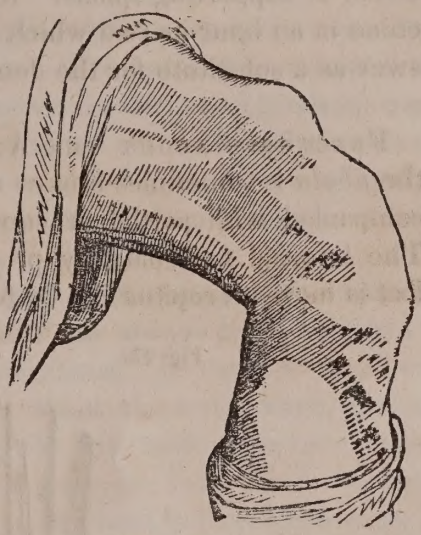
When one or both condyles are fractured, the limb is to be straightened so that the head of the tibia will press upon the condyles, and so cured with rollers and splints.

Fracture of the Patella.—This bone is generally broken *transversely*; the upper fragment is drawn up by the rectus femoris.

the patient cannot straighten the limb; and the fissure between the broken portions can be seen and felt, fig. 270.

Treatment.—The usual method of adjustment is to secure the limb in a perfectly straight position by a stiff splint extending down the back of the thigh to the calf of the leg, around which a roller is applied. The divided parts may be brought together by straps buckled around the limb above and below them, and drawn together by other straps attached to them, which pull the circular ones up and down until coaptation is complete. When the broken parts are not accurately adjusted, the union will be ligamentous instead of osseous.

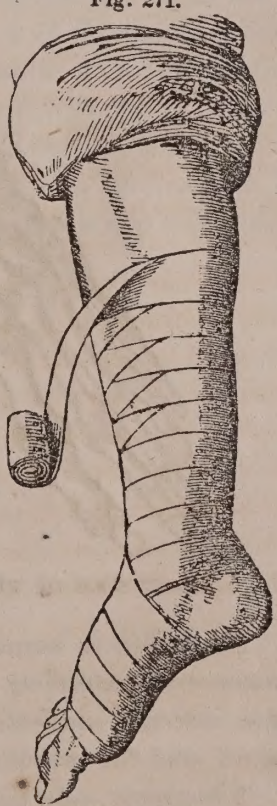
Fig. 270.



FRACTURED PATELLA.

When fractured *longitudinally*, the leg is to be extended, the parts brought together, and secured by bandage, compresses, and paste-board splints.

Fig. 271.



THE ROLLER

Fractures of the Tibia and Fibula.—These accidents are readily detected by the deformity, pain, crepitus, etc.

Treatment.—When the head of the tibia is fractured, the management is the same as for fractured condyles of the femur. What is commonly termed "broken leg," is a fracture of one or both bones between the knee and ankle. The double-inclined splint apparatus, or some similar contrivance, is here necessary. The application of the roller, fig. 271, which is the first part of the dressing, need not begin at the toes, as in the case of ulcers, nor be as firmly bound. This bandage is applied before the bones are fully adjusted, and not so tight as to prevent further extension. In all fractures the great toe is to be kept in a line with the inner edge of the patella. In *oblique* fractures, after the provisional application of the roller, the limb should be placed on the inclined splints, and extended until the two limbs compare exactly the foot is then to be

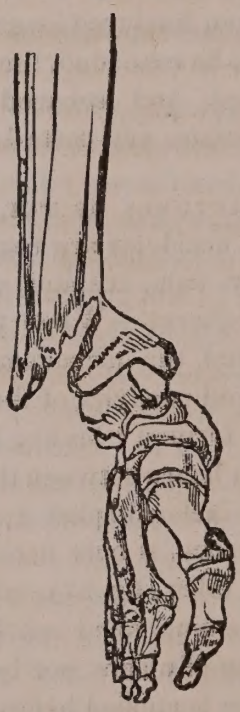
fixed to the foot-board by straps that will not stretch; and after the adjustment of the bones is completed, two or three splints are to be applied and bound with a roller, which is also to extend around the inclined or supporting splints. Any ingenious mechanic can make a machine in an hour or two which will serve as an inclined plane, and answer as a substitute for the double concave splints before mentioned.

Fractures about the Ankles.—By twisting the foot outward, the *fibula* is sometimes broken about three inches above the ankle, accompanied with partial or complete dislocation of the ankle, fig. 272. The internal malleolus, by projecting, forms a tumor, and when the foot is moved, crepitus can be felt just above the external malleolus.

Fig. 272.

FRACTURE OF THE FIBULA.

Fig. 273.



FRACTURED TIBIA.

The *tibia* is sometimes fractured near its lower end; it may be *transverse*, extending through the fibula; but is generally *oblique* with the *internal malleolus* also broken, fig. 273 The foot is turned inward, and the crepitus is felt on the inside.

Treatment.—In the first variety the dislocation must be reduced before the fracture is adjusted. The fractured parts are to be kept in

place by one splint at the back of the leg, another along the fibula, the foot-board, and the usual bandages. In the second variety a splint is to be applied on the side of the tibia.

FRACTURES OF THE FOOT.—Nearly all of these cases are connected with severe contusions and lacerations. The medical treatment is as important as the surgical. The cold water-dressings and bandages must be employed with a vigor proportioned to the intensity of the inflammation; and the fractured bones kept in their places by pasteboard or shellac splints, compresses, and bandages applied to meet the indications of each case.

Note.—There are some circumstances which the practitioner should *always* bear in mind, although they have not always been specified in treating of particular fractures and dislocations. In the first place, any injury of the kind, and especially those about the wrist, knee, and ankle, as well as complicated cases generally, are liable to severe inflammation. When fractured or dislocated parts are very painful or badly swelled from inflammation, this must be subdued before adjustment or reduction is attempted. In the second place, adjustment or reduction is always greatly facilitated by previously bathing the part in as warm water as can well be borne. Thirdly, in all cases of fracture or dislocations involving the structure of a joint, very gentle or passive motion should be made at the joint as early as is consistent with safety, to prevent anchylosis, or stiff joint. If made too soon, however, there is danger of re-displacement. The time and extent of this motion must be determined by the nature and place of the injured, the age and health of the patient, ect.

CHAPTER XI.

PARTICULAR OPERATIONS.

TREPHINING.—When performed for a fracture of the skull, a small opening is sufficient; but when the object is to evacuate matter, it should be larger. The requisite instruments are, a large and small trephine a Hay's saw, an elevator, a scalpel, with the common pocket-case. A flap is made through the scalp in the shape of the letter D, the circular side of which is raised, when loose fragments of bone, if

present, are to be removed. The lining membrane of the bones—pericranium—is next to be separated, or a circular incision made through it for the edge of the instrument. The trephine is to be applied so that the centre-pin will rest on a sound portion of the skull; the instrument is then turned steadily forward and backward, gentle pressure being made upon it at the same time, removing it frequently, and clearing the teeth with a brush; the groove must also be examined frequently, and the dust and blood removed with a piece of wetted sponge. When the groove is deep enough to steady the instrument, the centre-pin is to be withdrawn; and as soon as any point of the bone is cut through, an attempt should be made to raise the piece of bone within the circle; but if it does not succeed, the sawing should be very cautiously continued until the bone is nearly cut through all round, when it may be detached with ease. After purulent matter or extravasated blood is removed, or the depressed portion of bone elevated, the scalp is to be replaced and secured with the wet compress. The trephine should not be applied over a suture, nor over the course of the middle meningeal arteries.

Paracentesis Capitis.—The operation of puncturing the head has been resorted to in some cases of external dropsy. One of the fontanelles is the point usually opened; the fluid is drawn off very gradually, so as to avoid fainting. The wound heals readily, but the operation seldom succeeds in effecting a cure.

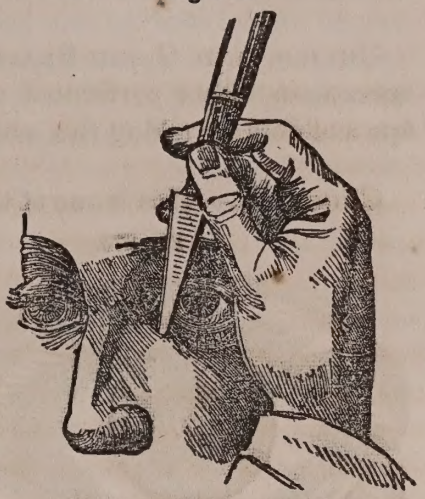
Paracentesis Oculi.—Tapping the eye to let out the humors is among the *regular* resources of chirurgery, when the inflammation is so intense that the "ordinary means" fail; but as the hydropath has ample and *extra*ordinary means to subdue inflammation, *he* will have no occasion to "operate" in this way.

In dropsical affections of the eye, attended with a gradual and permanent enlargement of the globe, protuberant eyeball, and excessive pain, the eye may be properly punctured. A common lancet, or couching needle, may be introduced behind the junction of the cornea with the sclerotic coat, into the posterior chamber. Some surgeons puncture the anterior chamber through the cornea.

Fistula Lachrymalis.—A small, sharp-pointed bistoury, or cataract knife, is held perpendicularly to the eyebrows, the point directed to the lower margin of the internal tendon of the eyelids, which may be seen on drawing the lids outward, the patient sitting erect, and the surgeon standing behind. The point of the instrument is pressed di-

rectly downward, fig. 274, until it enters the sac, which will be denoted by a flow of tears and mucus. The opening should be slightly enlarged outwardly as the knife is withdrawn. A probe, curved a little forward and inward, is then introduced, and, if necessary, pushed through into the nostril when a tube, style, or tent is inserted.

Fig. 274.



LACHRYMAL FISTULA.

ENTROPIUM AND ECTROPIUM.—The *inverted* lid can often be restored by cauterizing the outside of the lid, or by incising the mucous membrane. *Eversion* is often cured by a removal or division of the tarsus.

ANCHYLOBLEPHARON AND SYMBLEPHARON.—The first of these terms is applied to a growing together of the eyelids, which may be remedied by the use of olive oil, or any bland cerate; and the second, when the lids adhere to the eyeball. They are sometimes dissected apart, but the operation is not often successful.

PTOSIS AND LAGOPHTHALMOS.—The former case—elongation or drooping of the eyelids—may generally be remedied in the same way as entropium; and the latter—a shortening of the eyelids—may be treated as ectropium.

BLEPHARIDOPLASTICE AND RHINORRHAPE.—In relation to these formidable words, I can only inform the curious reader that the first applies to the formation of new eyelids and eyelashes from the adjacent integument; and the second, to new lids, or parts of lids, from the integument taken from the back of the nose. New eyelids have also been formed of the integument of the temple.

RHINOPLASTICE.—This operation, sometimes called *taliacotian*, consists in the formation of an artificial nose from the integument of the forehead or temple. In this and all similar cases, the particular circumstance of each case must determine the kind of operation required.

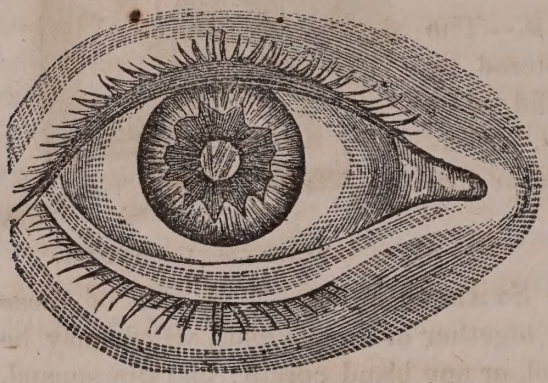
SCHLESEKTOMY—KERATOPLASTICE.—These terms have been lately applied to an operation for the formation of an artificial pupil. Experience does not justify it except in cases of complete blindness.

Otoplastice.—One of Taliacozzi's operations for forming a new ear out of the scalp of the back part of the head is so called.

Cheilo, and Genio-Plastice.—These are still other taliacotian operations, either performed or *proposed*, to restore lost parts of the lips and chin by taking the integument adjacent.

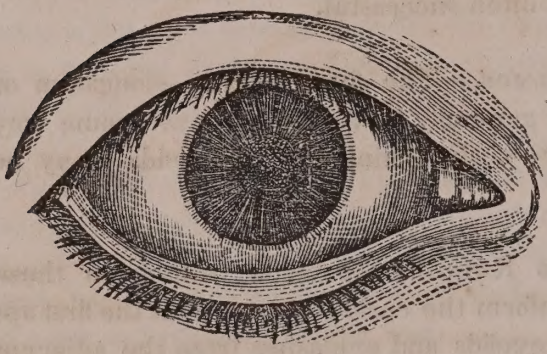
Couching.—This is one of the operations for curing blindness caused by cataract. The disease consists in an opacity of the crystalline lens, or its capsule, or both. The eye presents very different appearances in different forms of the disease. Fig. 275 represents a *hard* cataract; it has a radiated appearance, with an amber-colored center and gray circumference. Fig. 276 shows the appearance of the eye when the lens is in a soft pulpy or creamy state. Liston says, "the darker the color, the harder the cataract."

Fig. 275.



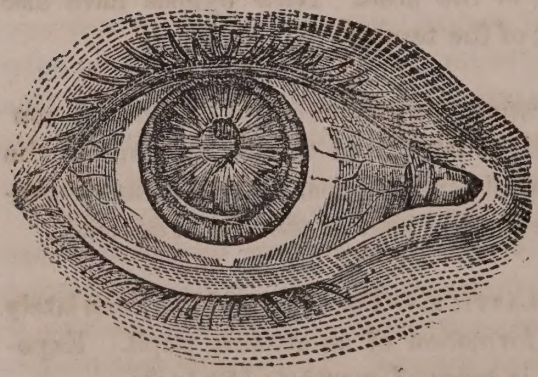
HARD LENTICULAR CATARACT.

Fig. 276.



SOFT LENTICULAR CATARACT.

Fig. 277.



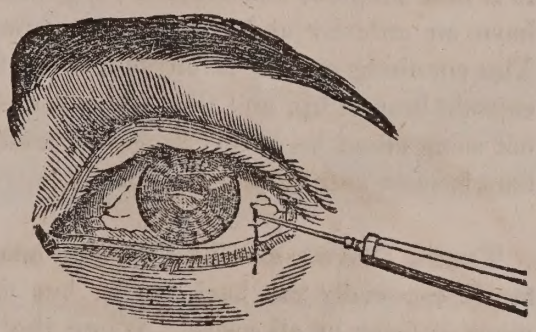
CAPSULAR CATARACT

Opacity in the *anterior* part of the capsule is usually indicated by a whitish spot in the center of the pupil, with a dark blue circle around it; and when the opacity is in the *posterior* portion, it appears concave, striated, and yellowish, and at a distance behind the iris, fig. 277. In the majority of cases, however, the affection is of a mixed character.

For a day or two before operating, surgeons usually keep the pupil dilated by the frequent application of some strong narcotic to the lids

and balls of the eye, as extract of belladonna, stramonium, etc. The head of the patient is steadied by an assistant, who also holds the eye fast with the speculum; the upper lid may also be held by the fingers of the assistant, and the under lid by the operator, who is obliged to prevent the eye from rolling with one hand, while the other handles the instruments. The usual position of the patient is a low chair, in a well-lighted room, and that of the surgeon, seated on a high chair in front, with a foot-stool to steady his elbow on his knee. The couching needle is introduced through the sclerotic, about two lines from the cornea, and a little below the horizontal axis of the eye, and its point carried slightly backward to avoid the iris; when the point of the needle is seen in front of the lens—by looking through the pupil—the capsule is to be detached from the lens with the sharp edges of the needle, and then pushed down out of sight. But if the lens itself, or its posterior capsule, then appear opaque, the edge of the needle is to be moved round its margin to separate the lens from the *tunica hyloidea*, and then the lens pushed down by placing the flat surface of the needle on top of it, fig. 278, below the pupil, and slightly backward into the vitreous humor; or it may be drawn down by thrusting the needle into it. If the lens rise on raising the needle, it is to be held down until it will remain stationary, when the operation is finished and the needle may be withdrawn. The patient should be kept in a dark room, and the eye closed and covered with a cold wet cloth for several weeks, until all danger of inflammation is passed.

Fig. 278.

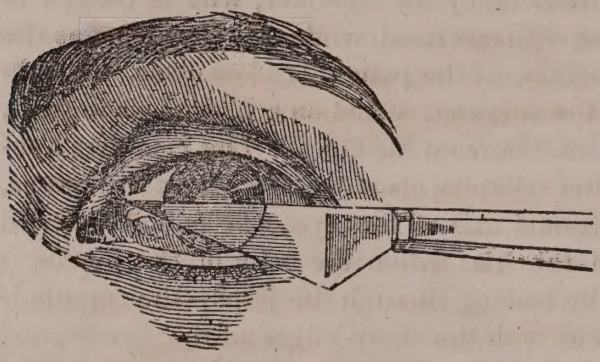


COUCHING.

EXTRACTION.—This is the operation for removing the opaque lens. The upper eyelid is supported by the *retractor*, or by an assistant instead of a speculum, and the lower one by the fingers of the surgeon. Resting his little finger on the patient's cheek, the point of the *cornea-knife* is passed edge downward through the transparent cornea, a little within its outer margin and above its center, and passing straight across, parallel to the iris, emerges at the opposite margin. The wedge-shaped edge of the knife advances in two directions round the cornea, making a semicircular section, fig. 279. On removing the knife, the lids are instantly closed, the operator giving the assistant a signal for the purpose. In a short time the eye is again opened, the

corneal flap raised, a needle inserted, and the capsule lacerated with it. Slight pressure is then made upon the ball, unless the lens passes out at the opening without. After examining the eye to ascertain if the iris is prolapsed—in which event the eye has to be exposed to a strong light, to cause contraction and retraction, or the iris pushed back—the cornea is adjusted, and the eye dressed with the compress and bandage.

Fig 279



EXTRACTION OF CATARACT.

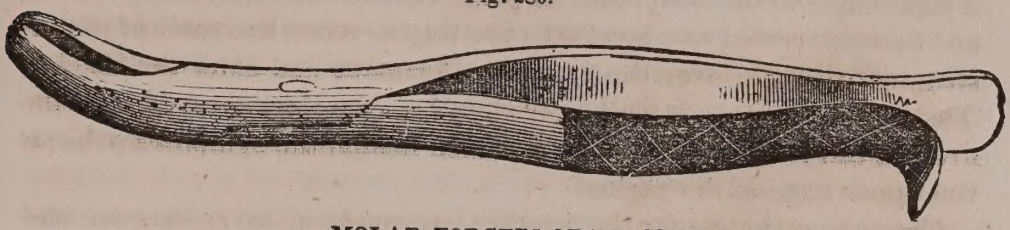
Absorption, or Solution.—This is another and the easiest method of disposing of an opaque lens, but it frequently has to be repeated. It is best adapted, however, to congenital and soft cataracts. Surgeons have an *anterior* and *posterior* operation; but the latter is preferable. The couching needle is introduced as for depression or couching, the capsule broken up, and the lens cut in several directions. If this does not soon effect its absorption, the needle is again introduced, and the lens broken into minute fragments.

Teeth Drawing.—The *turnkey* has long been in use for extracting teeth, especially the back teeth; but *forceps* are becoming more and more in favor in all cases. When the turnkey is employed, the gum should be cut cleanly from the neck of the tooth with the point of a sharp penknife, the hook of the instrument fastened upon the tooth as *low down* or near the jaw-bone as possible, and the fulcrum resting *on*, and not against the side of the jaw. This manner of adjustment will raise the tooth as nearly perpendicular as possible, and to that extent diminish the danger of breaking the jaw-bone. In some cases the neck or fangs of the tooth are firmly adherent to the jaw when a greater or less fracture is inevitable. The severe bleeding which sometimes follows the operation, can be readily checked by washing the mouth with the coldest water, and exposing it freely to the cool, open air.

When *forceps* are used, of which several sizes and shapes are manufactured to suit the different teeth, figs. 280, 281, and 282, the blades are to be pressed firmly down to the jaw, and while the tooth is raised by a steady force, slight lateral motions are to be made to loosen the fangs in the socket. In the extraction of *incisor* teeth, circular motion

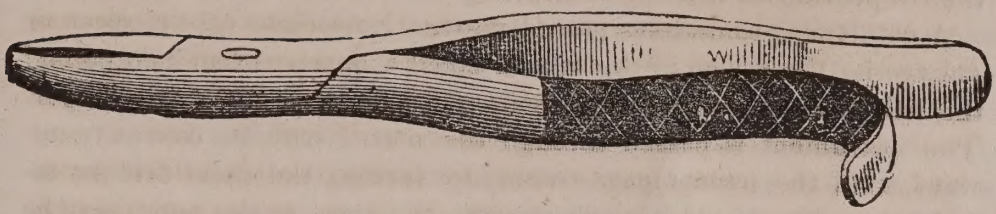
should be made. The cuspids may be extracted with the incisor, and the bicuspids with the molar forceps. In extracting fangs or "snags,"

Fig. 280.



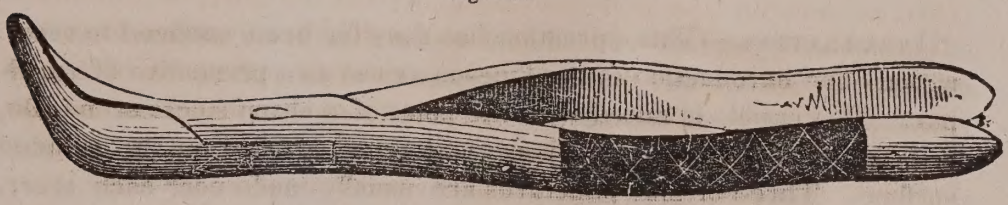
MOLAR FORCEPS OF DR. HILL.

Fig. 281.



COMMON INCISOR FORCEPS.

Fig. 282.



POINTED FORCEPS FOR EXTRACTING FANGS.

the gums are to be completely detached, and the sharp points of the forceps pressed as far down as possible, when the fragment is to be seized, raised, and rotated at the same time.

PUMPING THE STOMACH.—The introduction of the common stomach-pump requires no special directions; but in emergencies, as in cases of poisoning, the stomach can be emptied by introducing the elastic tube of the common injecting syringe, using the syringe itself as the pump. When it is withdrawn, the outer end should be closed, so that whatever liquid it might contain would not run back into the stomach.

CATHETERISM.—This term applies to the clearing and enlarging of various canals in the body, but is usually understood as pertaining solely to the passage of *the* catheter through the urethra into the bladder. Either a straight or curved tube can be inserted by any one familiar with the anatomy of the parts.

To introduce the *male* catheter most conveniently, the patient lies on the back with the shoulders somewhat elevated; the catheter is held at a right angle to the body until its point reaches the arch of the pubes, and then depressed to a level with the thighs, when the point of the instrument will slip over the triangular ligament and enter the bladder. The female catheter is easily introduced, as the thickened edge of the urethra can readily be felt about an inch behind the symphisis pubis, at the upper edge of the vagina.

Common catheters for the urethra are made of silver or gum-elastic. When the latter is introduced, a wire is contained within the tube to prevent its bending on meeting with resistance in its passage.

A catheter is sometimes passed into the Eustachian tube to clean or enlarge it; the orifice of the tube is about a quarter of an inch behind the soft palate, and is large enough for the insertion of the little finger. The instrument is passed through the nostril with its convexity upward, until the patient gags, when, by turning the point further toward the affected side, it will slip into the tube, or the point may be directed into it by the finger introduced through the mouth.

Inoculation.—This operation has thus far been confined to vaccination—the introduction of the kine-pox virus as a preventive of small-pox. The cuticle is raised with the point of a sharp lancet or needle, and the vaccine lymph, previously moistened, rubbed on the abraded surface. Three or four punctures are usually made near each other, on the outside of the arm above the elbow.

But the French surgeons are threatening us with another kind of inoculation, that of syphilis itself! It is announced in the late medical journals, that the wonderful discovery has been made that, by repeatedly inoculating the system with this virus until the system is *saturated* so that it will take no more, the system will thenceforward be proof against any further action of syphilitic poison. What *use* "the profession" in Paris or New York intend to make of this "discovery," is not stated; and I mention the subject for the especial purpose of reprobating the gross immorality as well as arrant quackery of the whole affair.

Œsophagotomy.—The gullet has sometimes been opened to extract foreign bodies, and to introduce food into the stomach. An incision is made between the trachea and sterno-cleido mastoid muscle; and the dissection made chiefly with the fingers, to avoid the recurrent nerve, the fascia being cut with the protection of a director. The operation may prolong, but seldom saves life.

Choking is generally produced by some substance lodging just above the cricoid cartilage, from which it is in most cases soon pushed forward toward the stomach, or raised a little, sticking fast in the pharynx, where it may produce suffocation by pressing upon the larynx and exciting spasm of the glottis. By opening wide the mouth, the article can generally be loosened with the finger, a fork, teaspoon, spoon-handle, or curved forceps. If it has passed below reach in this way, it may be pushed into the stomach with a *probang*, a piece of whalebone, having a rounded end, and covered with silk; or withdrawn by means of an air-pump.

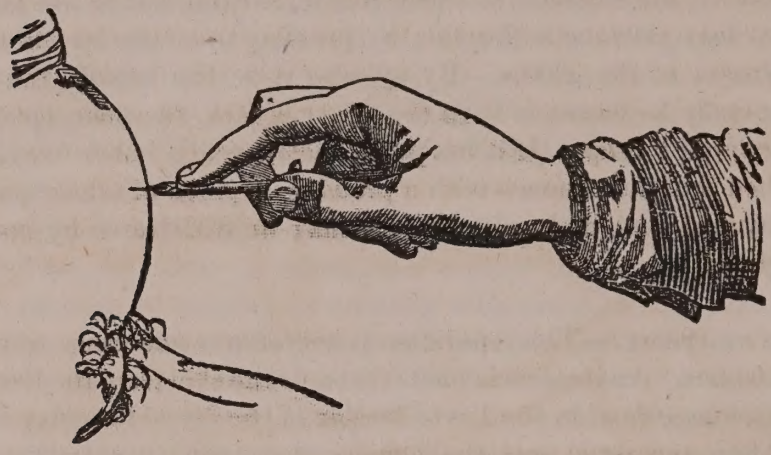
Laryngotomy.—This operation is sometimes necessary to remove foreign bodies. An incision is made through the skin from the lower side of the *pomum adami* to the lower border of the cricoid cartilage. The skin is then separated, and the cellular membrane ruptured with the handle of the scalpel, between the sterno-hyoid muscles down to the crico-thyroid membrane, when the point of the scalpel is passed suddenly through this membrane.

Tracheotomy.—The trachea or windpipe is sometimes opened in order to extract foreign substances. The place selected is the median line, extending from near the upper end of the sternum to the cricoid cartilage. It requires a skillful anatomist.

Paracentesis Abdominis.—"Tapping," as this operation is usually called, is performed in *ascites*, or dropsy of the abdomen; it is justifiable whenever the fluid is contained in a cyst, and when all the usual means for promoting the absorption of the fluid have failed. The patient sits in a chair; a bandage is made of a sheet folded about half a yard wide; this is placed around the abdomen, with a hole in front through which to operate, and crossed behind the back, where the ends are held by two assistants, who are to tighten it as the fluid escapes. The surgeon then makes an incision in the *linea alba*, two or three inches below the umbilicus, fig. 283, with a sharp lancet or bistoury, through which a blunt tube or canula is introduced to carry off the fluid. If faintness occur, the flow must be lessened or even discontinued for a time; and if excessive fainting supervene, the patient may be placed in a horizontal position, and the completion of the operation deferred for several hours, or even a day or two. The only dressing required is the adhesive strap and bandage; the patient must keep very quiet for several days, and then resume habits of exercise very gradually.

PARACENTESIS VESICÆ.—The bladder may be "tapped" above the

Fig. 283.



PARACENTESIS ABDOMINIS.

front of the pubes, or punctured through the rectum in males, or vagina in females, in obstructions which admit of no other method of relief.

IMPERFORATE ANUS.—Children are sometimes born with the integument closed over the rectum, which can be observed swelling beneath. A simple incision will remedy the difficulty. When the rectum cannot be reached, and in cases of its closure in the adult in consequence of disease, the only remedy is an artificial anus. This is usually made by cutting in the loins to the descending colon, and attaching the bowel by two ligatures to the lips of the wound; an incision is then made into it, and the lips of this wound more closely united with those of the first.

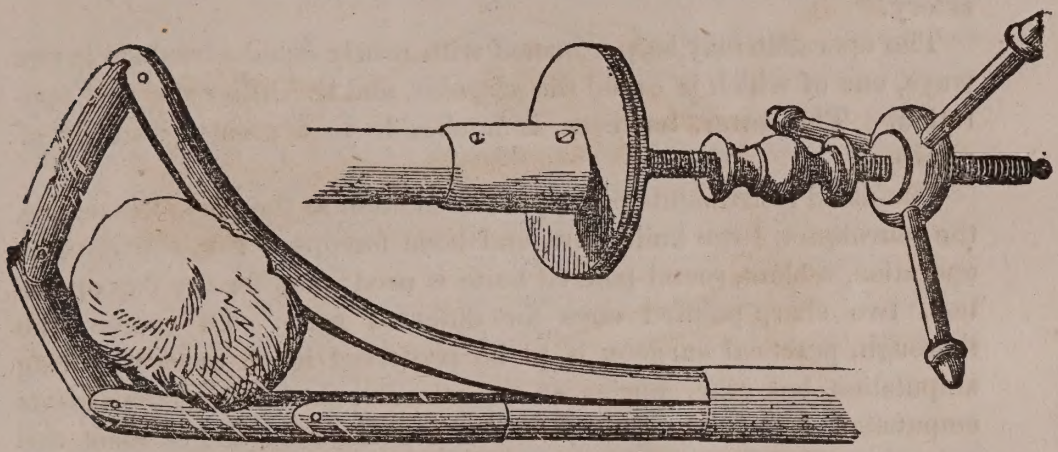
IMPERFORATE URETHRA.—When this is a congenital malformation, a round trochar is to be inserted, followed by a canula, and then by a catheter, and this is retained until the orifice heals.

LITHONTRIPSY AND LITHOTOMY.—Each of these modes are resorted to for stone in the bladder. The former operation consists in crushing it in the bladder with an instrument called the *lithontriptor*, and is only applicable to adults when the stone is soft and small; and the latter consists in cutting into the bladder with the gorget or knife.

The operation of lithontripsy is more frequently applicable to the female, by reason of the larger diameter of the urethra; and for the same reason, even this is very rarely necessary

For the operation of *lithontripsy*, the urethra must be dilated by bougies until the lithontriptor will pass. This instrument, fig. 284, is

Fig. 284.



LITHONTRIPTOR INCLOSING A CALCULUS.

then oiled and passed into the bladder, while closed, as a common bougie. When it comes in contact with the stone, the movable half is pushed in, by which the blades are opened at the several joints; it is then rotated from side to side, tightened occasionally, etc., so as to grasp the stone; when fixed between the blades—which fact is known by the inability to draw the sliding part back—the arms of the screw are turned gradually, by which the slide is withdrawn and the blades brought slowly and with great force together. After the stone has given way and the instrument closed, it is to be reopened and managed in the same way for any large fragments which remain. During the operation the patient is placed on a table, with the hips elevated and the bladder full, or nearly so; or it may be filled by injection through the catheter. After the crushing process is completed, the lithontriptor is withdrawn, the patient turned face downward, and directed to urinate as rapidly as possible; after which the bladder may be repeatedly injected and the powdered stone washed out.

In *cutting* for the stone, the *lateral* operation is now generally preferred, and *always* adopted by some of the most eminent living surgeons. But as no one will attempt it without special education in the dissecting-room, its description, which is somewhat tedious, need not be detailed here.

AMPUTATION.—The Water-Cure method of treating injuries, tumors, ulcers, and inflammations is destined to diminish very greatly the

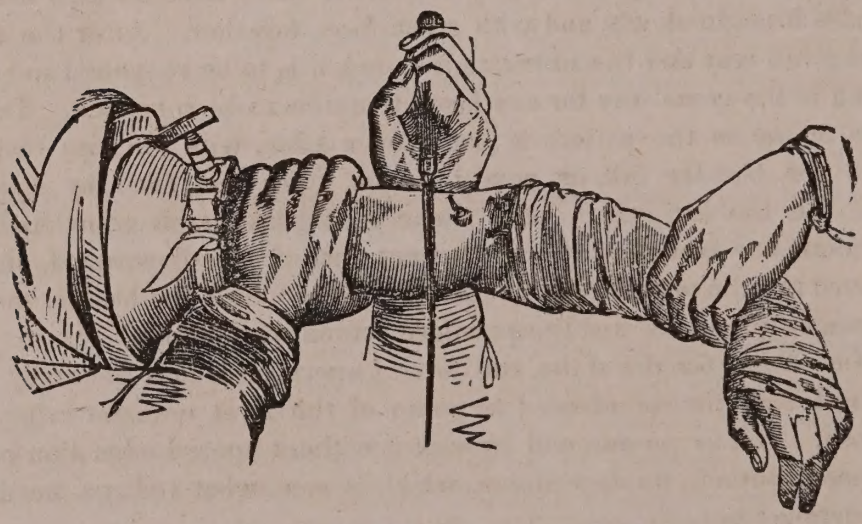
demand for this operation, which, however, is much more simple than is generally supposed, and can be performed by almost any person who combines a good mechanical tact in the use of tools, with a sufficient amount of anatomical knowledge to enable him to compress the main artery.

The operation may be performed with nearly equal advantage in two ways, one of which is called the *circular*, and the other the *flap* operation. The latter, however, is applicable to a greater number of places.

The usual instruments employed, in addition to the pocket-case, are, the tourniquet, large knife, saw, and bone-forceps. For the circular operation, a blunt, round-pointed knife is used; and for the flap operation, two sharp-pointed ones for different parts. Of course, the thorough, practical surgeon is to be preferred in all cases requiring amputation, but emergencies do sometimes exist in which *immediate* amputation is the only chance for the patient's life; and to meet this exigency, the following explanations are given:

The patient is seated in a chair, or placed on a bed or table; the pad of the tourniquet is fixed on the artery at a convenient distance above the place of operation. In the *circular operation upon the arm*, one assistant supports the forearm, and another grasps the arm above with both hands, and pulls back the integument as much as possible. The surgeon passes his hand under the arm, bringing the knife com-

Fig. 285.



CIRCULAR AMPUTATION OF THE ARM.

pletely over it on his own side, with the point downward, fig. 285, and makes the first incision by drawing the blade backward from hilt to

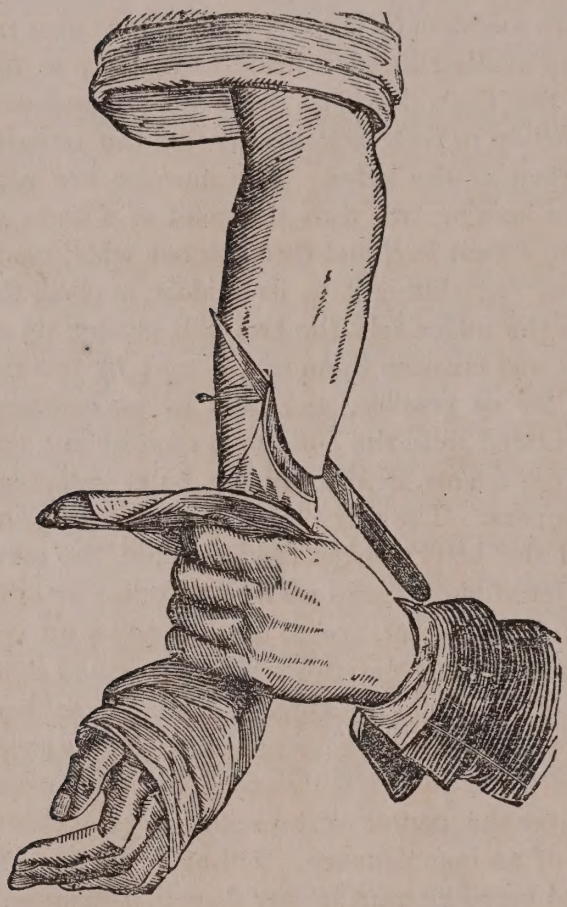
point, cutting through the skin and superficial fascia, entirely round the limb. The skin is then loosened from the muscles beneath, by separating the areolar tissue with a scalpel or bistoury; the skin is next retracted further up, and then another incision made as high up as the skin will allow, dividing all the flesh down to the bone. Some surgeons give an elliptical direction to both incisions, leaving the muscles longer before and behind than at the sides. The muscles are next separated from the bone an inch or two with the point of a knife or scalpel, and a strip of muslin, a yard long and three inches wide, made into a "two-tailed retractor," by slitting it to its middle, applied, the broader end being placed on the under side, the two tails passing up on each side of the naked bone, and crossing them at the top; by this the flesh is pulled upward as far as possible, and held by an assistant. The periosteum is then separated from the bone by a circular cut, and then the bone is sawed off, the splints, if any, remain, being smoothed off by the bone-forceps or nippers. The retractor is then removed, and the brachial artery tied. If the artery is not readily found, the tourniquet is loosened, when a jet of blood discovers it. All other arteries which bleed on loosening the tourniquet, are to be also taken up and tied. When the veins cease bleeding, the stump is to be washed clean and dressed by bringing the edges of the flesh together in an exact horizontal line across the middle of the stump, and there fastened by strips of adhesive plaster, three fourths of an inch wide and eight or ten inches in length, placing the first over the center of the seam, and the others laterally at about a quarter of an inch distance. Other straps may be laid obliquely over these, and narrow straps in any direction necessary to secure every part of the wound firmly; and a strap around the whole arm to secure all the others is also advisable. The stump is then covered with lint, retained by a light, easy bandage; and the dressings are to be kept constantly wet with cold water, if there is the least tendency to inflammation.

When animal membrane is used for tying the arteries, it may be cut off close to the knot and left to itself; but if linen or silk is employed, one end of the ligature must be left long enough to hang out between the straps. The dressing does not usually require removing under several days; and when they are removed or readjusted, the parts must be carefully supported by an assistant; the ligature must be taken away whenever it can be done by gentle pulling; but its removal should not be attempted within one week.

When it is necessary to amputate the arm high up, the subclavian artery should be compressed where it passes over the first rib, by the thumb of an assistant.

In the *flap operation for the forearm*, fig. 286 shows the proper position of the arm. The posterior flap is made first; and when the point of the knife reaches the bone, the hand is to be rotated a little inward, and the point pushed on close over both bones, taking care that it does not pass between them; when the blade passes over the ulna, the hand is to be rotated a little outward, to bring its point further down under that bone; the incision is then pursued downward and outward, so that the edge of the knife may emerge at about an inch and a half below, and at equal distance from, the points of entrance and emergence. The external flap is then raised a little, the knife entered at the former point, pushed through close in front of the bones, and brought obliquely downward, thus making a second flap to correspond with the first. The remainder of the operation and the dressings are similar to those of the former operation.

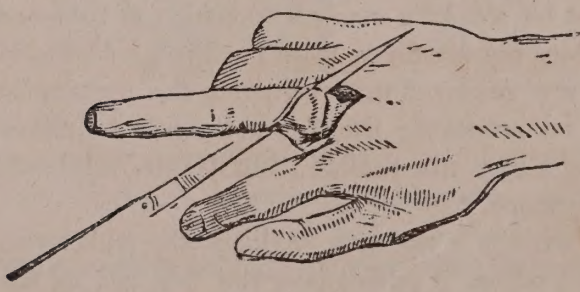
Fig. 286.



FLAP OPERATION.

Amputation of the fingers, though occasionally desirable at either joint, is most frequently performed at the base—the *phalangeo-metacarpal articulation*, fig. 287. An incision is made upon the knuckle in an elliptical form around the finger, extending down upon the palmar surface of the fin-

Fig. 287.



AMPUTATION OF THE FINGER.

ger about an inch, to make a flap large enough to cover the joint; after which the tendons and ligaments are cut through, and the joint dislocated by carrying the knife through it.

Ligating and Compressing Arteries.—These operations will usually be performed by the experienced surgeon; but emergencies will frequently exist in which it is indispensable to cut down upon and tie, or make compression on a large artery, in order to arrest a dangerous flow of blood, or prevent hemorrhage while removing tumors or other morbid parts. How and where to do these things, ought, therefore, to be matters of general information. In ligating arteries, the main points to be observed are, to make an *oblique incision* over it, and to avoid taking up the nerve, which is frequently inclosed in the same sheath with the artery. And in compressing arteries, a handkerchief or the thumb may be employed, making the pad or pressure to bear directly on the vessel. When the thumb is employed, the beating of the artery will direct the exact point for the pressure to be made, which is to be increased until the pulsation ceases.

The *subclavian* artery may be compressed by the thumb, and with difficulty in any other way, where it passes over the first rib, in the space between the first rib and clavicle, thus controlling the circulation of the entire arm. The *brachial* artery can be easily compressed on the inner side of the arm, about midway between the elbow and axilla, as it lies near the surface. The circulation of the lower limb may be effectually controlled by compressing the *femoral* artery at the groin just above Poupart's ligament; the pulsation of the artery can be felt immediately below the concavity of the groin; the thumb is here the most effectual instrument for compression, although a piece of cork, or the handle of a door-key, wrapped in several folds of linen, will answer.

The *large arteries of the neck* seldom require compression, except when large tumors are to be dissected out. The *common carotids* may be considered as resting on the transverse processes of the cervical vertebræ, and their circulation may be controlled by pressing them against those processes.

Note.—There are a few instruments required in some of the preceding operations which are found at nearly all the manufacturing shops; but an ocular view may enable the operator to have either of them made to order, should it prove necessary or more convenient. Fig. 288 represents the *double hook* employed in the operation for strabismus. Fig. 289 is the *curette* or *director* used in the same operation. Fig 290 is a pair of *fine hook* forceps. Fig. 291 is a pair of *curved*

scissors. Fig. 292 represents the silver *tube* inserted in cases of fistula lachrymalis. Fig. 293 is the *style* sometimes employed in the treatment of the same disease. Fig. 294 is the ordinary *curved couching-needle*, and fig. 295 is called *Hay's couching-needle*. The former needle is sometimes called Scarpa's, and is generally preferred.

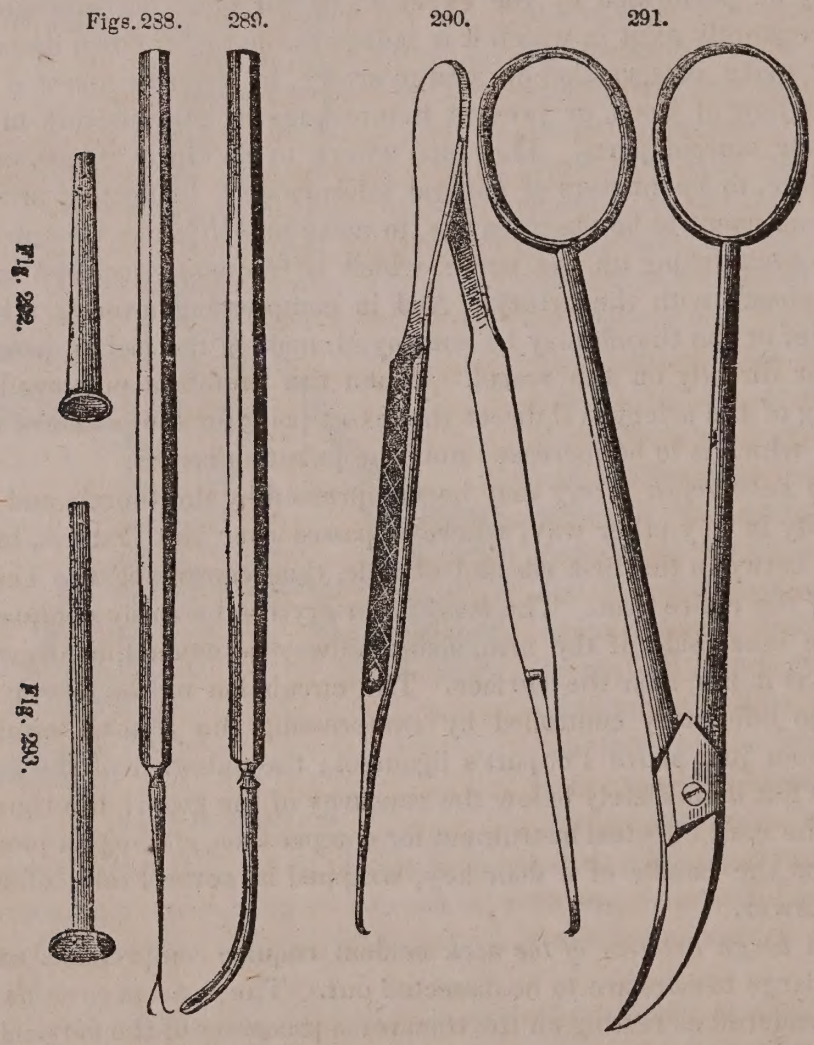


Fig. 294.

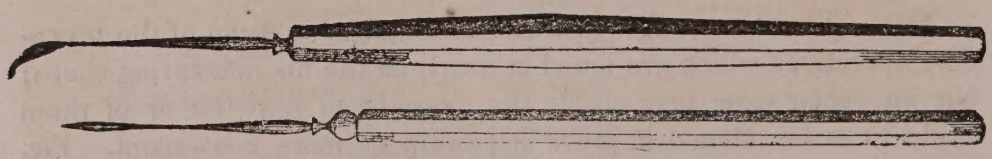


Fig. 295.

PART VIII.

MIDWIFERY.

CHAPTER I.

HISTORY OF MIDWIFERY

ANCIENT MIDWIFERY.—All history, sacred and profane, attests that the general practice of midwifery has been in the hands of females until a very modern date. It is true Hippocrates *theorizes* on obstetrics, but we have no evidence of his possessing any experimental knowledge on the subject. Historians tell us that in Greece, Rome, Persia, Egypt, Arabia, and Chaldea, woman was woman's physician. The Old Testament informs us that *female* midwifery was an honorable calling among the ancient Hebrews. "Since the beginning of history," says Mrs. C. M. Dall, "the lives of eighty-seven women, eminent not only for obstetrical skill, but capable of extended practice, have been written."

So far as the world has had experience in this matter, the success of female accouchers has been at least as great as that of male accouchers; and the statistics of all ages show that the *attendance* of woman has been accompanied with fewer accidents and a less number of fatal cases than the *practice* of man. Since it has been as fashionable as it is foolish to drug and bleed pregnant females occasionally, on the absurd notion that there are a great many *natural* "diseases of pregnancy," the success of our most eminent professional men-midwives compares rather unfavorably with that of many professional female midwives, who lived in happy ignorance of the whole of the modern drug and bleeding art.

MODERN MIDWIFERY.—Save in most parts of Great Britain and the United States, the general practice of midwifery still is in the hands of woman. In several European countries, the business is divided between male and female practitioners; but in the greater number of

countries on earth, civilized and uncivilized, woman officiates in all ordinary cases. Throughout Russia, at this day, educated females attend all classes of society, from the royal family to the meanest serf. The Chinese employ midwives in all ordinary cases, obstetrical surgeons being called upon only when instrumental assistance is necessary. The American Indians, the Otaheitians, the New Zealanders, and many other nations and tribes, who employ female midwives or none, are celebrated for easy births and exemption from accidents. In France, the *sage femme*, wise woman, is the principal accoucher. In Germany, the *vroedvrouw*, skillful woman, officiates. In Denmark her title is *iordermoder*, earth-mother. In Sweden and Norway she is called *iord-gumma*. In Spain and Portugal, the *co-madre*—literally, with mother—attends. All of these terms are equivalent to midwife in our language.

Female Authors and Practitioners.—Soon after the institution of the first medical school in Greece, the exclusive spirit of the faculty obtained the enactment of a statute prohibiting the practice of this art by "women and slaves." The tyrannical act spread dismay among the women of Athens; and so tumultuously did they rebel against the outrage upon "woman rights," that a new act was soon after passed allowing free-born women to learn midwifery. No other attempt was made by the profession to wrest this practice from its rightful owners until after the accession of Henry IV.

Among those who have attained eminence in this their peculiar department of the healing art, the following names may be mentioned in this place: Agnodike, the daughter of Hierophilus; she practiced successfully at Athens in defiance of the medical clique. Artemesia, the queen who assisted Xerxes at the battle of Salamis. Elpindike, of Greece, daughter of Cimon, and sister of Miltiades. Yroutata, of Salermo, who practiced in the latter part of the thirteenth century, and wrote several books. Mad. Perrette, who was sworn into the office of midwife, in Paris, in 1408, and became famous throughout France Mad. Gancourt, later in the fifteenth century, became equally celebrated. Mad. Francoise, the midwife of Catherine de Medicis, was an approved lecturer on obstetrics near the middle of the sixteenth century. Olympia Morata, born in Ferrara in 1626, wrote the lectures which her husband, a young physician, delivered at Heidelberg Mad. Perronne had the reputation of contributing all the obstetrical matter which was published in the works of the eminent French surgeon, James Guillemeau. Louise Boursin Bourgeois, born in 1580, married a surgeon, was appointed to attend the Queen of France, and

published many valuable works. Mad. La Marche, born in 1638, was an accomplished literary scholar, as well as extensive obstetrical writer and practitioner. Justine Dieterich Siegmunden, born in Silesia in 1650, was one of the most accurate anatomists of her day, an extensive practitioner of midwifery, and the authoress of several obstetrical works. Mad. Breton, in the eighteenth century, invented a plan for the artificial nourishment of babes. Elizabeth Blackwell, born in England in 1712, was the authoress of the first illustrated work on medical botany ever published. Mad. Ducondray, born at Paris in 1712, was the first person who lectured with a manikin, which she invented herself. Morandi, born at Bologna in 1716, was among the first to invent and perfect wax preparations. Mademoiselle Biheron, born at Paris in 1730, made still greater improvements in wax figures illustrative of obstetrical knowledge.

Sarah Stone, of England, was the authoress of a work published in 1737, called the "Complete Practice." Elizabeth Nihell, of London, was distinguished for successfully opposing a distinguished physician on one hand, and a notorious quack on the other. In 1760 she wrote a treatise on midwifery, in which she exposed the use of instruments, which the male accouchers were becoming too fond of employing; advocated the employment of women, and strongly protested against the interference of men. She declared that a curse followed their intermeddling, in evidence of which she adduced the increasing number of difficult and fatal labors. Mad. Reffatin, born in 1720, was the author of a work on "Delayed Accouchments." Margaret Stevens was the authoress of the "Domestic Midwife," published in London in 1795. Mad. Lunel published a work in Paris in 1750. Mad. La Chapelle, who officiated in over twenty-two thousand cases at the Maternité Hospital in Paris, ranks among the standard authorities on midwifery. Mad. Bovin, another standard authoress of several works, attended over twenty thousand cases, and performed nearly all the manual and instrumental operations known to the art as successfully as any male accoucher has ever done. Mad. Lesebours was the authoress of a work published in 1770. An Irish midwife, named Dunally, performed the Cæsarean operation successfully with a common razor. Mad. Rondet, born in 1800, perfected a tube for the restoration of children born asphyxiated. Mad. Dian was practicing reputably in 1821. Mad. Wittemback was consulted in relation to obstetrics by the most experienced physicians.

In the United States the following names occur in this connection: Old Mrs. Wiat, who died at Dorchester, Mass., in 1705, aged ninety-four years, assisted as midwife in more than eleven hundred cases. Mrs Whittemore, who died in Marlboro', Vermont, at the age of

eighty-seven, often traveled through the woods on snow-shoes to attend her patients, and of more than two thousand cases of births, she never lost a patient. Mrs. Elizabeth Phillips, who was born at Westminster, England, and commissioned to act as midwife by the Lord Bishop of London in 1718, removed to Charlestown, Mass., the following year, where her gravestone now records the honorable story that she assisted in successfully bringing into the world above three thousand children. Mrs. Jane Alexander, who died at Boston in 1845, aged sixty-one years, studied midwifery with Dr. James Hamilton, of Edinburgh, and practiced in this country twenty-five years without losing a patient. Mrs. Stebbins, who died at Westfield, Mass., in 1844, at the age of seventy-five, was an extensive and successful practitioner for many years. Similar facts could be greatly multiplied, but I have already enough for my purpose.

MAN-MIDWIFERY.—According to the best authorities we can find, man-midwifery, as a regular part of the physician's duties, dates back precisely one hundred and eighty-eight years, and then it originated with a court prostitute of Louis XIV., the Duchess de Villiers, who, under arrangements of the utmost secrecy, submitted to be attended by Julian Clement, an eminent surgeon. Clement was soon after appointed to the new and lucrative office of midwife to the Princess of France. Until that event the ordinary practice was entirely in the hands of female midwives, surgeons being called upon only *as surgeons* in cases of unnatural labors.

In the most uncivilized and unenlightened portions of the globe, a male midwife has never been heard of. A male accoucher was not known among the "Puritans" until this country had been settled more than a century. In 1723, Dr. John Maubray, the first male lecturer in England on this subject, wrote a book against the abuse of instruments, which the male accouchers were becoming too fond of employing. In fact, at that time the use of instruments was considered such an improvement on nature that, in the language of Dr. Gregory (*Man-midwifery Exposed*), "Almost every doctor, old or young, was for trying his hand at it." So notorious, indeed, was the rage for instrumental operations, that Sterne, in 1757, satirized it in "The Life and Times of Tristram Shandy, Gent."

Dr. Shippen, of Philadelphia, was the first lecturer on midwifery in the United States—1762. Dr. Atwood, of this city, in the same year, was the first to advertise himself as a man-midwife. And no longer ago than 1820, a Boston physician published and circulated a pamphlet advocating the exclusion of females from the practice, and the substitu

tion of males. At the present time, nearly every allopathic medical journal in the world is vehemently opposed to relinquishing this practice into the hands of females, while every progressive and reform periodical I am acquainted with as earnestly advocates the restoration.

WHO SHOULD BE MIDWIVES?—I confess to be of that number who advocate a restoration of the practice of midwifery to *educated* females; but I am very far from desiring to see it taken from the hands of educated physicians and entrusted to ignorant nurses. I hold, however, that *all* females should be sufficiently intelligent on this subject to manage an ordinary labor, and certainly the education required for this purpose is exceedingly simple—so much so that the majority of females could and would acquire it without any teacher whatever, if they were entirely left to themselves, and thereby compelled to become self-instructed. It is very true, moreover, that the multitudinous disorders and deformities existing in artificial society, do now, and will for a long time to come, render surgical assistance necessary in certain cases; and for this purpose the practical surgeon-accoucher should be retained for accidents, complications, and emergencies. His services would be rarely called in requisition if we had properly-educated females to take the entire management of the ordinary practice; and surely no one will pretend that young men can be taught the simple yet delicate duties of a companion and attendant during childbirth, more readily than young women can, or be more efficient in the discharge of the responsible duties devolving. The reason young women are not so educated, or are but imperfectly educated, is because the immense influence of an interested profession is arrayed against them.

CHAPTER II.

REPRODUCTION.

THEORIES of REPRODUCTION.—No subject has engrossed a greater share of the attention of philosophers and physiologists in all ages of the world than the mysterious function by which the great command, "increase and multiply," is fulfilled. All the theories which ingenious minds have fabricated may be resolved into three, and perhaps two; although no less than *two hundred and sixty-three* modifications of those theories have been proposed. Without wasting any time upon these

fanciful speculations, it is enough for all practical purposes, to understand that sexual association is necessary to the propagation of our race; and that the female furnishes the ovum or germ of the future being, while the male communicates the vivifying principle. Both, however, equally concur in supplying the actual elements of its organization originally; but the mother has the greater modifying power over the development of those elements, on account of the constantly commingling of the circulating fluids of mother and child until birth, and the nourishment of the child being derived directly from the mother during the period of early infancy.

Transmission of Organization.—Nothing is better established than the fact that the character and quality of the organization of the child are dependent on that of both parents; and this fact is of immence importance in its bearings on the well-being of the family of mankind. Though this principle is pretty well understood in the management of cattle and in improving the breed of horses, it is very generally overlooked in theory or disregarded in practice as relates to the human being; and it is to me a matter of astonishment that the standard works on physiology and obstetrics in our medical schools never elucidate the subject, and seldom allude to it. But surely all who contemplate the matrimonial relation, as well as all who are already in that relation, ought to know that precisely according to the development, purity, and vigor—in a word, HEALTH—of their own bodily and mental constitution, will be the physiological integrity and mental character of their offspring. It should be universally known, too, that the passion which impels to procreation, lying at the very foundation of existence, is of necessity one of the most powerful of the propensities; and that, while its rational and legitimate exercise is conducive to health, moral purity, and intellectual vigor, its excessive indulgence or abuse is as conducive to physiological enervation and moral degradation.

It is the common consent of the medical world that libertines, drunkards, and gluttons, cannot have healthy children; but we ought to be able to trace the sources of infirmity beyond their grosser manifestations. Neither the father whose nerves are shattered by tobacco, whose digestion is disordered by improper food, whose constitution is impaired by drug medicines, or whose blood is often inflammatory with the violence of ungoverned passion; nor the mother whose muscular system is enfeebled, whose nerves are debilitated, or whose abdominal organs are contracted and rigid, and whose brain is constantly irritated by indolence, novel reading, constipating food, strong coffee, green tea, or the frequent indulgence of the passionate or fretful mood,

can do justice to the rising generation. If in any of these ways they "eat sour grapes," the children's teeth will certainly be "set on edge." In this way, too, do the sins of the fathers and mothers curse their own offspring through many generations.

The extremes of excessive toil and absolute indolence alike dispose to a vitiated organization; and we see the lamentable evidences equally among the wretched millions who toil incessantly for less than a sufficiency of food and raiment, and the profligate idlers of a more luxurious but scarcely better fortune. Nature never intended that constant labor should agree with the constitutions of a part of mankind, and constant idleness or dissipation be compatible with the rest. Those whose muscles are perpetually worked down to the point of absolute exhaustion, require all the rest and sleep they can get to replenish the muscular system; and the brains being but little exercised, will naturally degenerate, and they will propagate a race comparatively idiotic. Those who exert the brain intemperately, and suffer the bodily functions to decline, will subject their offspring to feeble constitutions and unbalanced minds; and those whose life is a dull round of indolent repose, or dissipation, will entail the bodily and mental qualities of grossness, vulgarity, debauchery, and selfishness.

A very common source of debility on the part of parents, and hence imperfect organization on the part of offspring, is the abuse of amativeness. No false delicacy can excuse those who assume to be teachers, for refusing to speak plainly on a matter which so much concerns human health and happiness; and I cannot better acquit myself in this duty than by making the following quotation from a recent work (*Organic Laws*), by J. Bradford Sax:

"The various organs and faculties of the parents are transmitted to the child with all their peculiarities and conditions. The perfection with which they are transmitted depends upon their degree of activity at the time of parentage; the more active they are at the time the more perfectly will they be inherited. Hence, in order to secure perfect offspring, it was provided that during the act of parentage all the organs and faculties of the body and mind in both parents, but especially in the father, should be stimulated to the highest possible degree of activity. Of course a corresponding reaction must afterward take place.

"Now it is impossible that such violent or intense vital stimulations and reactions should occur without an immense expenditure of nervous or vital energy on the fund of life. In point of fact, no act or function is so exhausting to the whole system as this. If indulged in to excess, no practice can possibly be so debilitating, depraving, and de-

structive to all the organs and faculties. Probably more of the nervous fluid or influence is expended in a single sexual crisis than would suffice to carry on all the ordinary vital operations, perhaps for days. If it is indulged in daily, or even weekly, the deluded subject need not hope for health or happiness."

In a recent and very excellent work (*Popular Education*) by Ira Mayhew, A.M., late Superintendent of Public Instruction in Michigan, the author remarks: "Physiologists in general coincide in the belief that a vigorous and healthy physical and mental constitution in the parents, communicates existence in the most perfect state to their offspring; while impaired constitutions, from whatever cause, are transmitted to posterity. In this sense, all who are competent to judge are agreed that the Giver of life is a jealous God, visiting the iniquity of the fathers upon the children unto the third and fourth generation of them that hate Him or violate His laws. Strictly speaking, it is not *disease* which is transmitted, but organs of such imperfect structure that they are unable to perform their functions properly, and so weak as to be easily put into a morbid state or abnormal condition by causes unimpaired organs are unable to resist."

The Marriageable Age.—Ample statistical data have settled the question that the first children of those who marry very young are more animal and less moral and intellectual than those born nearer the middle period of the life of the parents. Extensive observation has also established the position, that the great majority of men and women, morally and intellectually eminent, have been among the younger children of the family. The elevation and improvement of the race, therefore, seems to be adversely affected by early marriages. The soundest physiologists and phrenologists regard twenty-two to twenty-five for the female, and twenty-five to thirty for the male, as the most appropriate ages for assuming the serious duties as well as participating in the pleasures of matrimonial life.

Physiological Law of Marriage.—Physiologists are divided on the question, whether organizations similar or unlike are most conducive to vigorous offspring. Phrenologists generally maintain that temperaments decidedly different, provided those differences are not extreme, make the most fortunate alliances for the offspring; and the same principle is held in relation to the mental organs. This proposition is strongly corroborated by the favorable results of cross-breeding in the lower animals, and even from the cross-marriages of the people of different nations, so far as observations have been recorded. I ap

prehend, however, that this law, if it be a law, derives its principal importance from the erroneous habits and customs of society. People who "live, move, and have their being" under one dull, monotonous routine of surrounding circumstances, will become mentally stupid, and physiologically indolent and sensual, for want of suitable external circumstances to call out the mind and exercise the body; and here cross-breeding, or the union of different temperaments, tastes, habits, fashions, and differently-developed faculties, will tend to excite and cultivate the powers of both parties. But when both parties are healthfully developed in body and mind, actively yet not drudgingly engaged in some occupation which gives free exercise to all the functions and faculties, the voluntary habits being at the same time physiologically correct, there is not, certainly, an equal reason, if, indeed, there is any, to seek for aught save the most congenial tempers.

CHAPTER III.

PHYSIOLOGY OF THE FŒTUS.

Fœtal Development.—About two weeks after impregnation, the new organization becomes about as large as a pea, and its two envelopes, or membranous coverings, called *chorion* and *amnion*, with a gelatinous substance inclosed between them, are distinctly visible. A thin membrane is also formed over the whole internal surface of the uterus, called the *decidua*. Soon after a small white thread-like substance appears, which is the commencement of the brain and spinal marrow; before the twentieth day the eyes are visible; and before the first month is completed a cartilaginous or grisly substance indicates the future bones.

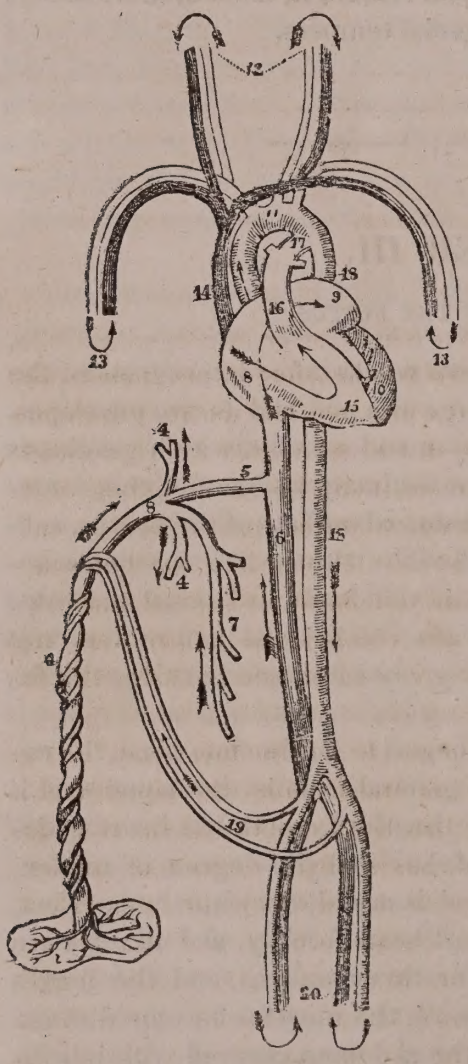
In the second month the cartilage begins to harden into bone, the rudiments of the teeth are visible, the general form is developed, and it is about an inch in length. During the third month the heart is developed, and, although without blood, has a slight degree of motion. At the end of three months, the eyelids are distinct, the lips perfect, the fingers and toes apparent, the heart beats forcibly, and all parts are well defined, the weight being two or three ounces, and the length four or five inches. In the fourth month the muscles become distinct, the brain and spinal marrow firmer, the abdomen covered with integument; a large portion of the bony structure is ossified, the rudiments

of the second set of teeth are seen under the first, and the substance called *meconium*, begins to collect in the bowels.

Near the middle of the fourth month, the uterus rises above the pelvis into the cavity of the abdomen, when the mother becomes remarkably sensible of the motions of the fœtus. This period has been called *quickening*, upon the erroneous supposition that the fœtus then first became endowed with life; but it is truly alive from the moment of conception. Sickness at the stomach, tendency to faintness, etc., denote the disturbance occasioned by the sudden change of position.

From four to nine months the general development is more rapid. In the fifth month the situation of the nails can be discerned, the weight is about one pound, and the length about nine inches. In the sixth month the head becomes downy, and the nails marked; the weight increases to one and a half or two pounds, and the length to twelve inches. During the seventh month the hair is perfected, the nails fully formed, the bones are comparatively firm, the meconium collects lower down in the large intestines; weight about three pounds; length about fourteen inches. Many children are capable of being raised if prematurely born at this period, and even in some cases if born a month or two earlier. During the eighth and ninth months, no new phenomena present, but every part acquires a firmer consistence, and all the functions become more active.

Fig. 296.



FŒTAL CIRCULATION

Fœtal Circulation.—Until quite recently the opinion prevailed that the blood of the mother circulated directly through the vessels of the fœtus; but it is now known that the fœtus has a sort of independent existence, although

its nutrient materials are of course derived from the mother. The mother secretes the substances of nutrition, which, by coming in contact with the fœtus, are absorbed; and, after being modified in their passage through the placenta, are digested and assimilated. Fig. 296 is a representation of the fœtal circulation.

1. The umbilical cord, consisting of the umbilical vein and two umbilical arteries; proceeding from the placenta (2.) 3. Umbilical vein, dividing into three branches; two (4, 4), to be distributed to the liver; and one (5), the ductus venosus, which enters the inferior vena cava (6). 7. Portal vein, returning the blood from the intestines, and uniting with the right hepatic branch. 8. Right auricle; the course of the blood is denoted by the arrow, proceeding from 8 to 9, the left auricle. 10. Left ventricle; the blood following the arrow to the arch of the aorta (11), to be distributed through the branches given off by the arch to the head and upper extremities. The arrows, 12 and 13, represent the return of the blood from the head and upper extremities through the jugular and subclavian veins, to the superior vena cava (14), to the right auricle (8), and in the course of the arrow through the right ventricle (15), to the pulmonary artery (16). 17. Ductus arteriosus, which appears to be a proper continuation of the pulmonary artery; the offsets at each side are the right and left pulmonary artery cut off; these are of extremely small size as compared with the ductus arteriosus. The ductus arteriosus joins the descending aorta (18, 18), which divides into the common iliacs, and these into the internal iliacs, which become the hypogastric arteries (19), and return the blood along the umbilical cord to the placenta; while the other divisions, the external iliacs (20), are continued into the lower extremities. The arrows at the terminations of these vessels mark the return of the venous blood by the veins to the inferior cava.

The pure blood is brought from the placenta by the *umbilical vein*; this vein passes through the umbilicus, and enters the liver, where it divides into several branches, two or three of which are distributed to the left lobe of the liver; one branch communicates with the portal vein in the transverse fissure, supplying the right lobe; and a large branch, the *ductus venosus*, which, passing backward, joins the inferior cava. In the inferior cava the pure blood is mixed with that which is returning from the abdominal viscera and lower extremities, and is carried along through the right auricle, guided by the Eustachian valve, and through the *foramen ovale*, into the left auricle. From the left auricle it passes into the left ventricle, thence into the aorta, and, by means of the carotid and subclavian arteries, is distributed to the head and upper extremities. The impure blood is returned from the head and upper extremities by the superior vena cava to the right auricle; from this it is propelled into the right ventricle, and thence into the pulmonary artery. As the lungs are solid and impervious, only a small quantity can pass into them, and hence the greater portion passes through the *ductus arteriosus* into the commencement of the descending aorta, where it is mingled with that portion of the pure blood which is not sent through the carotid and subclavian arteries. Passing along the aorta, a small quantity of this mixed blood is distributed by the external iliac arteries to the lower extremities; the greater part is con-

veyed by the internal iliac, hypogastric, and umbilical arteries to the placenta; the hypogastric arteries proceeding from the internal iliacs, and passing by the side of the fundus of the bladder, and upward along the anterior wall of the abdomen to the umbilicus, where they become the umbilical arteries.

"From a careful consideration of this circulation," says Dr. Wilson (*Human Anatomy*), "we perceive, 1st. That the pure blood from the placenta is distributed in considerable quantities to the liver before entering the general circulation. Hence arises the abundant nutrition of that organ, and its enormous size in comparison with other viscera.

"2dly. That the right auricle is the scene of meeting of a double current, the one coming from the inferior cava, the other from the superior, and that they must cross each other in their respective course. How this crossing is effected, the theorist will wonder; not so the practical anatomist; for a cursory examination of the fœtal heart will show. 1. That the direction of entrance of the two vessels is so opposite, that they may discharge their currents through the same cavity without admixture. 2. That the inferior cava opens almost directly into the left auricle. 3. That by the aid of the Eustachian valve, the current in the inferior cava will be almost entirely excluded from the right ventricle.

"3dly. That the blood which circulates through the arch of the aorta comes directly from the placenta; and, although mixed with the impure blood of the inferior cava, yet is propelled in so great abundance to the head and upper extremities, as to provide for the increased nutrition of those important parts, and prepare them, by their greater size and development, for the functions which they are required to perform at the instant of birth.

"4thly. That the blood circulating in the descending aorta is very impure, being obtained principally from the returning current in the superior cava, a small quantity only being derived from the left ventricle. Yet it is from this impure blood that the nutrition of the lower extremities is provided. Hence we are not surprised at their insignificant development at birth; while we admire the providence of nature that directs the nutrient current, in abundance, to the organs of sense, prehension, and deglutition: organs so necessary, even at the instant of birth, to the safety and welfare of the creature."

The *foramen ovale* becomes gradually closed by a membranous layer which separates the two auricles. As soon as the lungs are inflated by inspiration, the blood of the pulmonary artery rushes through its right and left branches into the lungs, to be returned by the pulmonary veins to the left auricle.

The Thymus Gland.—This structure is situated on each side of the trachea in the neck, resting against the pericardium, and extending from the fourth rib upward to the thyroid gland. It becomes perceptible between the second and third months of embryotic existence, and continues to increase in size until the seventh month; during the ninth month it suddenly enlarges again, weighing then nearly an ounce. After birth it enlarges during the first year, and then gradually diminishes, almost disappearing at puberty. It is composed of numerous lobules, containing secretory cells, and its office appears to be to prepare nutrient material until the digestive function is fully developed.

The Placenta.—This is a spongy, vascular mass, found at the surface of the chorion, and adherent to the uterus, which exists in some form in all mammalia. It possesses little or no sensibility, hence it has little or no nervous structure. It is to the fœtus what the lungs are to the adult, serving for the aëration of the blood of the former until respiration brings the blood in contact with atmospheric air in the lungs. Fig. 297 represents the placenta with the umbilical cord attached. The diameter of the placenta is usually about six inches, and its thickness an inch and a half.

Fig. 297.

PLACENTA AND CORD.

Physiologists do not agree whether the vessels of the placenta terminate in or communicate with those on the uterus; or whether, in its uterine portions, there are intermediate cells in which the arteries terminate, and from which the veins commence. Nor do they agree whether any portion of the blood of the fœtus actually circulates through the heart, lungs, etc., of the mother. From all the investigations which have been made, my own conclusion is, that the placenta serves, in part, to purify the blood; and that the blood of both mother and fœtus mingles, to some extent, in the placenta, in consequence of the placental vessels extending into the uterine sinuses: and that, further, while the blood of mother and fœtus act and react upon each other in the substance of the placenta, in a manner analagous to the action between water and blood, in the bronchial vessels of aquatic

animals, some portion of the blood of the fœtus does actually go the round of the mother's circulation.

The Umbilical Cord.—The *funis*, *cord*, or *navel-string* forms the connection between the placenta and child. It is composed of two arteries and a vein, and, like the placenta, is insensible. The arteries wind spirally around the vein from right to left, forming in their course a number of loops or knots. The length of the cord varies greatly; its average is eighteen or twenty inches. The pulsation of the cord, which is usually strong and distinct, ceases in ten, fifteen, or twenty minutes after birth, and the portion attached to the child shrinks and falls off in five or six days.

The Liquor Amnii.—This term is applied to the fluid which collects in the cavity of the amnion; it is secreted by the internal surface of this membrane, and its quantity varies from a pint to several quarts; the average is from one to two pounds. It serves as nutriment to the fœtus; to allow it free motion; to diminish the force of blows, shocks, and sudden movements, and also assists in dilating the os uteri during labor.

CHAPTER IV.

OBSTETRICAL ANATOMY

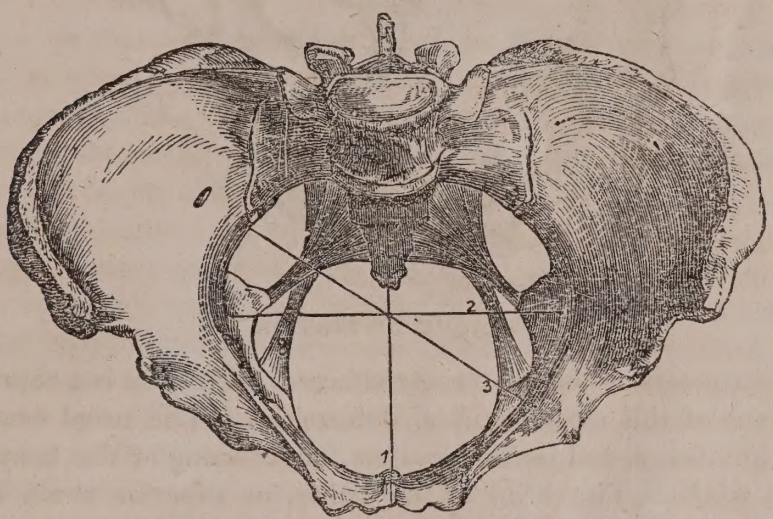
Bones of the Pelvis.—The *ossa innominata* form the pelvis laterally and in front, each of which is divided into the *ischium*, or sitting-bone; *ilium*, or hip or haunch-bone; and *pubis*, or share-bone, as heretofore explained; and the sacrum and coccyx behind. The *brim of the pelvis* is defined by the ilio-pectineal line. All below this line is called the *true* or *lower pelvis;* while the *false* or *upper* pelvis, which is really the lower part of the abdominal cavity, is immediately above. The brim of the pelvis is of an oval form, except where it is broken by the projecting part, or promontory, of the sacrum posteriorly.

Cavity of the Pelvis.—This is bounded by the sacrum behind, the ischium laterally, and the pubis in front. It is of unequal depth, measuring five to six inches posteriorly, three inches and three fourths from the brim to the tuber ischii, and from two inches to two and a

half anteriorly at the symphisis pubis. The bones of the pelvic cavity are smooth on their inner surface, and present a series of inclined planes, tending at first downward and slightly backward, then downward and forward. The brim or upper margin of the cavity, which is its narrowest part, is called the *superior strait;* and the lower or outlet, the *inferior strait.* This outlet is of an oval shape, but irregular; its lateral boundaries are immovable, but its antero-posterior diameter can be extended on account of the mobility of the coccyx.

DIAMETERS OF THE PELVIS.—The three principal diameters are

Fig. 298.



DIAMETERS OF THE PELVIS.

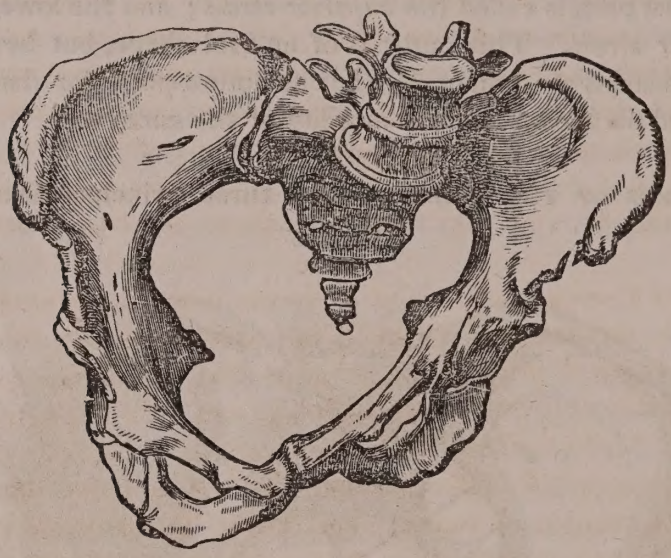
represented by the lines in fig. 298. They are the *antero-posterior* (1), from the prominence of the sacrum to the inner and upper edge of the symphisis pubis; the *transverse* (2), across the widest part of the brim, at right angles to the antero-posterior; and the *oblique* (3), from the sacro-iliac junction of one side to the opposite side of the brim, just above the acetabulum. The average admeasurements of these diameters are: antero-posterior, four inches; transverse, five inches; and oblique, four and three fourths. Half an inch either way may be allowed for variations. The circumference varies from thirteen to fifteen inches.

The only practical importance of these admeasurements is in cases of deformities, disease, or mal-presentations. In ordinary cases nature will accomplish her work just as well without our knowledge of obstetrical anatomy as with it.

DEFORMITIES OF THE PELVIS.—The bones of the pelvis may be

distorted in a variety of ways, and to an extent which renders labor tedious and protracted, or entirely impossible. These cases, however, are extremely rare, and it not unfrequently happens that the aggregate

Fig. 299.

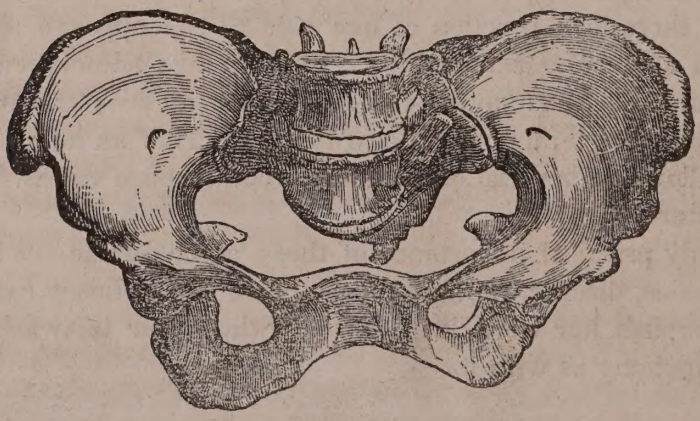


OBLIQUE DISTORTION

of the diameters is not materially affected. Fig. 299 is a representation of one of the most common deformities. The usual causes are rickets in infancy, and *mollities ossium*, or softening of the bony structure, in adults. The brim of the pelvis, or superior strait, is most frequently affected by deformities, so that if the child's head can enter the cavity, the delivery will almost always be accomplished naturally, although the labor may be greatly prolonged.

The extreme distortion in the antero-posterior diameter of the brim

Fig. 300.



ANTERO-POSTERIOR DISTORTION.

of the pelvis, is seen in fig. 300. This is one of the conditions which render natural labor impossible, although slight deformities in this respect are usually overcome by the natural efforts.

CHAPTER V.

PREGNANCY.

Signs of Pregnancy.—The cessation of menstruation at the usual period of its occurrence is among the first indications, though not in itself conclusive of pregnancy. Most women experience some degree of nausea, and sometimes vomiting on rising, called morning sickness; this usually begins in the fifth or sixth week, and continues to the end of the third month. Salivation sometimes, though not often, attends. The breasts manifest an uneasy sensation of fullness about two months after conception; throbbing and tingling pains succeed, and they soon increase in size and firmness, become knotty, and the areola around the nipples darkens; these are the most unequivocal of all the signs of pregnancy. The enlargement of the abdomen is gradual from the first, although in some cases it becomes a little flatter for a month or two. Quickening occurs usually during the fourth month, after which the motions of the fœtus are decisive.

Duration of Pregnancy.—The natural duration of pregnancy has usually been reckoned at nine calendar or ten lunar months, or two hundred and eighty days. A majority, probably, are born in the fortieth week; nearly as many in either the thirty-ninth or forty-first; many births take place in the thirty-eighth, forty-second, and forty third weeks; and they are not very unfrequent in the thirty-seventh, forty-fourth, and forty-fifth weeks. The ordinary period seems therefore to range from two hundred and fifty-two to three hundred and sixteen days. The commencement of pregnancy is generally dated two weeks subsequent to the last appearance of menstruation; yet this calculation is liable to an error of between two and three weeks.

Extra-Uterine Pregnancy.—In some extraordinary instances, the precise causes of which we can never understand, the ovum is impregnated, and remains in the ovary, fallopian tube, or the inter-

space in the walls of the uterus. In all these cases the general signs of pregnancy are more or less apparent, while the enlargement of the abdomen is confined to one side, and develops very much like an ordinary tumor, with a sense of weight, uneasiness, heat, and pain. Sooner or later the cyst which incloses the fœtal mass ruptures, the child dies, and the surrounding parts either accommodate themselves to their peculiar circumstances as well as may be, and allow the organic remains to occupy the part for an indefinite period, or make an effort to remove the fœtus by the formation of an abscess opening externally, or a fistulous communication to the vagina or rectum, through which the osseous parts of the mass are discharged.

The practitioner must here restrict his or her duty to keeping the patient quiet, attending to the general health, especially keeping the stomach and bowels easy, and soothing all local inflammation, always recollecting that nature best accomplishes what she undertakes in her own way.

Superfœtation.—The occurrence of a second conception before the termination of the first, has been regarded as impossible by many authors; yet there are some well-authenticated cases on record. Sometimes both fœtuses are fully developed, and the second born several months after the first; in other cases, one fœtus is expelled in a half-formed or blighted condition. Practically we are to regard the latter variety as a case of abortion.

Pathology of the Fœtus.—Nearly all the maladies to which the child is subject may affect the fœtus; and when we consider how unhealthfully the majority of females live while in the pregnant state, and how readily the organic instincts, true to the all-pervading law of self-preservation, throw the morbid conditions of the mother upon the new being within, it seems almost wonderful that so great a majority can live until the time for being born arrives. But the fœtus does often die in the uterus, and it is sometimes important to ascertain the fact. The signs are: a cessation of its motions; flaccidity or falling in of the abdomen; recession of the umbilicus; a sensation of coldness, and of a dense weight in the abdomen; the breasts suddenly becoming flaccid; to which may be added a loose feeling of the uterine tumor, failing health, sunken countenance, dark areola round the eyes, fœtid breath, frequent chills, etc. Here, as usual, we are to "trust to nature." At an uncertain time the uterus will expel its contents, and the treatment required is the same, in all essential particulars, as for ordinary abortions.

Hygienic Management during Pregnancy.—Those females who would escape the usual and dangerous maladies which frequently accompany pregnancy, and avoid in a great degree the ordinary pains of childbirth; and, above all, those who would be mothers of *healthy* children—healthy in body and mind, in constitution and in disposition—must observe attentively and obey inviolably a few simple hygienic precepts. 1. All high-seasoned, high-salted, and complicated dishes must be abstained from. The whole course of diet must be plain and simple, and *coarse* enough to keep the bowels always free. Animal food, if used, should not be taken more than once a day. 2. All drugs must be eschewed, especially every thing of the narcotic kind, as opium and its preparations, which have a direct tendency to stupefy and enfeeble the future being. 3. Some form of bath must be taken daily; a towel wash will answer, and it need not be very cold; about 70° will do very well; and if the patient is very sensitive or feeble, it may be taken in a warm room. Pregnant women usually *bear* cold water remarkably well. 4. The hip-bath should be frequently employed, especially near the period of delivery. For a month or two preceding the expected time it should be employed daily; this may not be so cold as to be particularly disagreeable; 65° to 70° in temperature, and five to ten minutes in time, is a good general rule. 5. The patient must keep on her feet a good part of the time during the whole term. She may walk frequently in the open air, or do house-work, or exercise in any easy manner in the erect attitude. Nothing is more likely to induce a wrong position of the child in the womb, or a painful, lingering labor, than pressing and cramping the abdomen by sedentary habits. Females who are compelled to work with the needle, or sitting at a work-table, should be particularly careful at all times to maintain an upright posture. Adhesions of the afterbirth, flooding, tumors, and inflammations of the parts are frequently owing to the compression produced by a misposition of the body. 6. Excessive labor and violent exertions, also strong mental passions, or depressing emotions, are to be avoided as far as possible.

Accidents of Pregnancy.—Medical books give us a formidable catalogue of "diseases of pregnancy;" but I think the phrase is another of those misnomers which are so plentiful in the books, and so well calculated to mislead. Diseases *during* pregnancy are common enough; but so far from being naturally *of* that condition, they are merely the evidences of the *unnatural* habits or circumstances of the individual.

The familiar fact that those diseases which rapidly exhaust the vitality of the body, as consumption, are suspended during pregnancy, to re

appear with all their formidable and fatal array of symptoms soon after the completion of the reproductive function, sufficiently attests the principle that nature is true to her own purposes, and that all diseases during pregnancy are entirely fortuitous.

Abortion, which is the expulsion of the fœtus before the sixth month, and *premature labor*, its expulsion between the sixth month and maturity, are the most painful disorders or accidents attending pregnancy. The danger is usually in proportion to the hemorrhage. The common causes are general or local debility—"inward weakness"—violent mental perturbation, and bodily shocks or injuries. Leucorrhœa is the cause of the greatest number of miscarriages. Excessive sexual indulgence is also a frequent cause.

The *symptoms* of miscarriage are, an unusual sense of languor, uneasiness, and weariness, with aching or pain in the back, followed after a few hours or days by a slight discharge of mucus or blood from the vagina, and bearing-down pains; these are at first felt in the back, extending around the loins to the abdomen, and down the thighs, recurring at regular intervals, and increasing in strength and frequency; in most cases the pain is as great as in labors at the full term. In some cases the ovum is expelled with but little pain, and sometimes the fœtus is expelled and the membranous shell of the ovum retained for many days, and perhaps finally passed off in a dissolved state with the lochia. Hemorrhage seldom continues after the expulsion of all parts of the ovum, but until then it is to be apprehended. As a general rule, the flooding is less the nearer gestation approaches maturity.

Our first *treatment* should be preventive; but if the case has progressed too far, the flooding requires our principal attention. Allopathic authors deal largely in opium, ergot, sugar of lead, and the forcible extraction of the ovum with instruments, and even bleeding from the arm. These drugs and destructives are *never* necessary, but *always* injurious; in fact, they often injure the constitution much worse than the abortion does.

The patient should recline in an easy, recumbent posture, the wet bandage be applied around the abdomen, and changed several times a day, and two or three vaginal injections of cold water employed daily. When the flooding is excessive, and in cases of internal hemorrhage, denoted by headache, great lassitude, shiverings, frequent and feeble pulse, and the patient becoming pale, exhausted, and faint, with a dark shade under the eyes, the tampion may be employed with advantage, or a silk handkerchief, wet in the coldest water, or inclosing a cylindrical piece of ice or snow, may be introduced into the vagina as far as convenient; it may remain for six or eight hours, and then be in-

troduced again if necessary. Enemata of the coldest water are also valuable auxiliaries in severe cases. In all cases it is important to have the room well ventilated, and the patient placed on a cool and rather hard bed or mattrass. The inexperienced attendant should not be unduly alarmed at the *faintness* which takes place after severe or protracted flooding, for it generally happens that this condition favors the formation of a clot or coagulum, which obstructs the bleeding vessels and effectually arrests the hemorrhage. It is not uncommon for patients to remain an hour or two in a state of *deliquium animi*.

Morning sickness, when very troublesome, is best alleviated by a light, dry evening and morning meal, as Graham crackers, toasted bread, etc.

Toothache may be relieved by eating very sparingly for a day or two, and careful attention to the bowels.

Cramps, for which the old-school practice is, bleeding and laudanum, may be quieted by rubbing the lower limbs with a cold wet cloth, followed by dry friction.

Constipation is more apt to occur in the early than the later months of pregnancy. It requires coarser food and water-injections.

Piles, which have previously affected the patient, are liable to reappear or become aggravated. Frequent sitz-baths should be employed, with a small, cold injection immediately before each stool.

Pruritus, or itching of the genital organs, may be relieved in the same way; if excessive, warm water is more soothing than cold.

Heartburn, *sick headache*, *sleeplessness*, and *salivation*, are among the unpleasant incidents that are occasionally presented. They are to be treated in the same way as morning sickness. Frequent sips of cold water are very soothing in most of these cases; and when the sick headache is attended with prolonged nausea and retching, warm water should be drank freely until the stomach feels easy, or vomiting occurs.

Cravings or *longings* for improper food should *not* be gratified. There is vastly more danger of "marking the child," by improper indulgences on the part of the mother, than by proper self-denial. If the mother takes proper care of her general health, and keeps all unhealthy articles out of her stomach, the trouble from this source will be of little consequence.

Pains in the breasts are sometimes severe. They may always and safely be relieved by cold wet cloths, covered with dry; except when of a spasmodic or neuralgic character, in which case warm fomentations are appropriate.

Excessive vomiting sometimes occurs, and may be so severe as to en

danger abortion. Fasting, and cold water-drinking, are the specia. remedies.

Pain in the side—usually the right—often occurs after the middle period of pregnancy; it is rarely severe, but generally constant. Bleeding, leeching, cupping, and blistering have been perseveringly prescribed for it by "old-school" doctors, but without the slightest benefit in the great majority of cases. The wet bandage and hip-bath are the better remedies.

Difficulty of breathing frequently affects the patient more or less toward the completion of the term; in some cases it is attended with severe *cough*. Indolence or over-exertion are alike to be regarded in the treatment. Great fatigue of body or mind should be avoided. Lifting heavy articles, running up stairs, walking too fast, are among the excesses against which the patient should be cautioned.

When *hemorrhage* occurs, it is to be regarded as a premonition of abortion, and treated accordingly.

Diarrhea is among the unusual occurrences. The treatment is, hip-baths, the abdominal bandage, cold injections, and a strict dietary.

Difficult urination sometimes proves very annoying. When it amounts to actual retention, the catheter may have to be employed; this, however, is extremely seldom. Cold hip-baths and bandages are usually sufficient. Foot-baths are also useful; and in severe cases the warm hip-bath, immediately followed by the cold, will often relieve.

Varicose veins, with a swelling and knotty appearance of the lower extremities, sometimes result from the obstructed circulation occasioned by the pressure of the uterine tumor on the adjacent blood-vessels. Attention to the general health, and a judicious regulation of the amount of exercise—neither too much nor too little—are all the therapeutic indications in this case.

Hysteria is named among the "diseases of pregnancy" by authors. I have never known it to occur in females whose hygienic habits were reasonably correct; and the affection is probably always attributable to novel reading, exciting company or parties, stimulating drinks, irritating food, cathartic and opiate medicines, etc. The treatment is wholly negative—an avoidance of these causes.

Convulsions are less frequent occurrences than hysterical paroxysms, but are produced by the same general causes, and can be prevented or cured by their avoidance or removal.

CHAPTER VI.

PARTURITION.

RATIONALE OF LABOR.—Many ingenious, if not profound specula tions, have been written by medical philosophers, to explain *why* the fœtus and its appendages are expelled from the womb at about the end of ten lunar months, or two hundred and eighty days. As well might they have expended their learning in endeavoring to divine why man arrives at a given stature, and then ceases to grow; or why the earth performs its circuit around the sun in three hundred and sixty-five days, instead of a longer or shorter period. We are sufficiently wise for "our being's end and aim," if we know the fact that *it is so*. But the physiology of parturition, which it behooves us to understand, is easily explained.

As the ripened fruit drops from its parent stem, so the fœtus, when sufficiently developed for independent existence, is separated from its parental connection. A slight discharge of mucus, often more or less tinged with blood, called *labor-show*, and which serves to lubricate and prepare the parts for the requisite distention, is the first decisive indication of approaching labor. Wandering pains about the back, around the abdomen, and down the thighs, gradually becoming fixed and regular, with intervals of perfect ease, denote the preparation going on in the uterine region. Each labor "*pain*" is produced by a distinct, periodical contraction of the longitudinal and circular fibres of the uterus, which diminish its diameter and dilate its mouth. These contractions, and consequent pains, are renewed at certain intervals until the dilatation is sufficient to permit the passage of the child without injury to the soft parts. The pain experienced by the patient bears no very near relation to the force of the contraction of the uterus, but is rather measured by the healthful condition or morbid sensibility of the parts. Those who live healthfully, suffer but little; while many of opposite habits, endure the most excruciating agonies.

In the early stage of labor, the pains are called *cutting* or *grinding*; they are of an acute and stinging character, and are occasioned by the stretching of the fibres of the os uteri. In the second stage, the contraction of the uterus is aided by the contraction of the abdominal muscles—some writers say the *voluntary* efforts of the patient; but this

action takes place whether the patient wills it or not—when the patient is *obliged* to co-operate with the expulsive effort, by holding her breath, and then the pains are called *forcing*, or *bearing-down*. The forcing or expulsive pains gradually increase in severity, but the patient usually bears them better as the labor approaches its termination. Says Dr. Churchill (*System of Midwifery*): "The amount of suffering depends a good deal upon the temperament of the patient, and upon the habits of life among savages it appears slight, but it is excessive in civilized life." There is an important lesson implied in the above quotation. Happy will it be for those mothers who can appreciate and apply it.

The remarkable peculiarities of labor pains are, their periodicity; the intervals of perfect ease, during which the patient is often inclined to sleep; each uterine contraction gradually increasing to its maximum of force, and then suddenly subsiding, the intervals of rest diminishing, and the length of the pain increasing as the labor advances. The membranes are sometimes ruptured, and the water of the amnion discharged at the commencement, and sometimes not till very near the conclusion of labor; and not unfrequently the water escapes on the first occurrence of the premonitory pains. Sometimes the membrane does not rupture at all, and the child is expelled entirely inclosed—in common parlance, "born with a vail."

The Pains of Childbirth.—An erroneous interpretation of Scripture has caused the opinion to prevail extensively in the civilized world, that great suffering is the ordained law of woman in childbirth; and this error has had a paralyzing effect on the popular mind, and caused the sufferers to submit reverently to their fate, instead of seeking the true light of physiology on the subject. If Eve was sentenced to bring forth in sorrow, it was because of her personal transgression. Show me a woman on earth who agonizes through the period of parturition, and I will prove her to have transgressed the laws of health in her own person; and conversely, find me a mother who lives physiologically, and I will show you one with whom the act of childbirth has neither agony nor terror.

The philosophy of this matter is admirably expressed in a little work (*The Curse Removed*), by Dr. T. L. Nichols: "The women of nature have no such word as 'confinement'—a word so appropriate in civilization. The great truth to be learned by every body is, that gestation and parturition are natural processes. It is as natural for a woman to bring forth children, as for a shrub to produce flowers and fruit; and her organs are as naturally adapted for the purpose. In a state of

health no natural process is painful. Pain is, in all cases, the sign of disease. It has no other use or signification. With a sore throat, it is painful to swallow; with a diseased stomach, digestion is painful; so is childbirth painful to a diseased nervous system, but never to an entirely healthy one.

"It is not credible that any natural function should be attended with pain in a healthy state of the system. All nature protests against the idea—all experience is opposed to it. Causes and effects are too well adapted to each other—ends and means too admirably fitted. This world is the work of infinite power and benevolence; all the human system is the masterpiece of all this fair creation. It is not to be supposed that the most important of all the functions of the most perfect of created beings, of whom we have any knowledge, should be subject to inevitable pain and peril in its performance. Such a belief is an insult to Providence. When God looked upon His creation, and pronounced it good, He could not have overlooked the most important function of His last and most perfect work; and there can be no question that in the original creation of woman, she was fitted to obey the command, 'Increase and multiply, and replenish the earth,' without peril or pain. The very idea of the curse inflicted upon her carries with it the belief, that she was originally created perfect in this particular.

"What, then, has made the change? Why is woman subjected to all her pains, sufferings, outrages, and perils, in the performance of the great function of her life? It is because the forbidden fruit of enervating luxuries and excesses is continually eaten. And just in proportion as woman transgresses the laws of nature, which are the real and unquestionable commands of God, just so far are they subject to the curse.

"Man has it in his power to incur all direct curses by transgression, or to avoid all curses and invoke all blessings by obedience to the divine law. Industry makes of the barren earth another Eden. Temperance and cleanliness give health, and health brings happiness in all the duties of life. So it is with woman. Indolence, self-indulgence, voluptuousness, and all the sins against the laws which God has written in the structure of our bodies, bring with them the curse of deranged nervous systems, broken health, irregularity of function, disease, pain, and premature death. Every woman is an Eve, and forbidden fruits are all around her. If she listen to the voice of the beguiling serpent, hers is the wo. But, on the other hand, faith in God, obedience to His laws, and living in harmony with His works, assure to woman health and safety, and joy, in fulfilling all her destiny. These are

truths pregnant with meaning, and incontrovertible as the principles of nature."

Mrs. Pendleton remarks *(Parent's Guide)*: "It is a well-established fact, that women are to be found in almost every country who suffer no pain in childbirth. Now, as a natural law never admits of an exception, this exemption from pain could not occur in any individual unless it were fairly within the capabilities of the race."

Mrs. Gove—now Mrs. Dr. Nichols—testifies *(Lectures to Ladies)* "I know many mothers who, with their husbands, have adopted the 'Graham System,' or, in other words, those correct habits recommended in these lectures (that is, attention to diet, exercise, and bathing freely and constantly with pure, cold water), and those mothers have abridged their sufferings in parturition from forty hours to *one hour*, and have escaped altogether the deathly sickness of the three first months of gestation."

George Combe observes *(Constitution of Man)*: "The sufferings of women in childbed have been cited as evidence that the Creator has not intended the human being, under any circumstances, to execute all its functions free from pain. But, besides the obvious answer, that the objection applies only to one sex, and is therefore not to be too readily presumed to have its origin in nature, there is good reason to deny the assertion, and to ascribe the sufferings in question to departures from the natural laws, in either the structure or the habits of the individuals who experience it."

The late Dr. Andrew Combe wrote: "If women in childbed could be convinced, from previous knowledge, that, as a general rule, the danger attending that state is proportioned to the previous sound or unsound condition of the system, and to its good or bad management at the time, and is not the mere effect of chance, they would be much more anxious to find out, and successful in observing, the laws of health, both for their own sakes and for the sake of the future infant, than they now are, while ignorant of the influence of their own conduct."

Dr. Eberle's opinion *(Theory and Practice)* is to the same effect: "The pregnant female who observes a suitable regimen, will, *cæteris paribus*, always enjoy more tranquillity both of mind and body, and incur much less risk of injury to herself and child than she who, giving a free rein to her appetite, indulges to excess, or in the use of improper articles of food."

Dr. Dewees, Professor of Obstetrics in the Medical School of Pennsylvania, has argued *(Thesis on Childbirth)* that "Pain is a morbid

symptom, the consequence of artificial modes of life and treatment, and can be avoided by appropriate habits and treatment."

In corroboration of this already conclusive weight of authority, I can add, that I have known females in the city of New York adopt a reform system of living—a plain, simple, vegetable diet, with a daily cold bath, and go through the period of gestation without losing an hour from sickness, the ordeal of parturition with no assistant or attendant in the room save the husband, take the entire charge of the child from the moment of its birth—assisted, of course, by its other parent—and "recover" without experiencing a single symptom of any one of the numerous diseases so common to the lying-in period. This shows that nature can be returned to, as well as departed from, even among civilized people.

I am aware that the easier labors of the less civilized portions of the human family are accounted for by some on the supposition that the children have smaller heads. There is something in this circumstance, no doubt; but if the mother lives properly, and the fœtus is healthfully nourished, the osseous structure will be so elastic and pliable that the size of the head, though larger among the educated classes, will constitute no serious obstacle to easy delivery.

Among the improper habits which are the sources of the pains and perils of childbirth, improper food, unquestionably, ranks foremost. The immediate causes of the pains are a rigidity and inflexibility of the soft structures on the part of the mother, and advanced ossification of the bones of the cranium on the part of the child. Acting upon this theory, Mr. Ramsbotham, of London, instituted an experiment, which was published in 1841 (*Essay on Human Parturition*), for the purpose of securing safe and easy delivery. The experiment succeeded perfectly; and, although I do not explain the result as others have, the facts are just as interesting. Mr. Ramsbotham restricted the patient principally to vegetables and fruits; farinaceous articles, as wheat, barley, beans, peas, rice, and especially fine wheaten flour, being but sparingly employed on account of the phosphates of lime and magnesia they contain. Mr. R.'s idea was, by withholding some portion of the natural bony constitutents, to de-ossify the systems of both mother and child to some extent—to produce an absolute *abnormal* state—trusting to a more farinaceous diet, after parturition, to supply the requisite elements of bone. The same experiment has been repeated in this country in several cases, and always successfully.

Now I think the whole explanation is furnished by the principle of a more plain, and simple, and less concentrated diet. Such a dietary will always keep the system open and unobstructed, and the excre-

tions free, so that the superfluous particles of earthy matter, if any exist in the farinaceous articles, will be readily washed away. The real objection to urge against farinaceous food is, that being highly nutritious, most persons, without a large admixture of fruits and vegetables, are very apt to eat too much. I agree entirely with Mr. R., that the diet is far the most important of any one of the hygienic considerations affecting the security or happiness of the pregnant female, or the health of her offspring.

Medicating Labor Pains.—The fashion of giving ergot and other "forcing medicines" to expedite delivery, has prevailed to an alarming extent; happily, however, it is now on the decline But the anæsthetic agents, ether and chloroform, are threatening to have "a run" among ever-changing medical fashions. Among the advantages alleged by Dr. Stearns, who first introduced the employment of ergot in 1807, was "saving to the accoucher a considerable portion of time." *Perhaps* an hour or two of a doctor's time is more precious than the health of the infant—and perhaps not. "The pains induced by it," says Dr. Stearns, "are *peculiarly forcing*." Again says the doctor, "since I have adopted the use of this article, I have seldom found a case that *detained me more than three hours!*" Dr. Beck tells us the profession is divided on the question, "Whether the use of ergot has an injurious influence on the child—some maintaining that its common use is the principal cause of the increasing number of still-born children." Now it is perfectly clear, that if it forces the uterus to rapid and extraordinary "forcing" contractions, it must to precisely that extent expose the mother to tearing and laceration of the soft parts, and endanger an injurious and fatal compression of the child's head in the passage; and further than this, if the child is not soon born after its administration, the narcotic properties of the drug—which are known to be potent—may narcotize or destroy the child through the medium of the circulation. The only plausible argument which has ever been advanced for its use is, that the strong uterine contraction which it induces, will tend to the prevention of hemorrhage. But when it is considered that there is no danger of hemorrhage under ordinary circumstances, and that, in those extraordinary cases in which it does occur, we have a surer resource in simple cold water, the argument appears almost foolish. As long ago as 1812 it was noticed by many physicians, and recorded in the New England Journal of Medicine and Surgery, "that in a large proportion of cases where ergot was employed, the children did not respire for an unusual length of time after birth, and in several cases they were irrecoverably dead." "Since then," says Dr. Beck, "a large

amount of testimony has been furnished, confirmatory of the truth of this suggestion." Still more pointed and direct evidence is found in the following statistics, collected by Dr. Beck. Dr. Ward, of New Jersey, who used the article extensively, came to the conclusion, that unless the child was expelled in forty minutes after its effect was apparent, it would be born dead. Dr. Hosack gave it in three cases, and the result was three still-born children. The late Dr. William Moore, "a veteran practitioner of obstetrics in this city," testified, "It appears to be injurious to the child *at all times*, for in every case in which I have seen it exhibited, the child was still-born." Dr. Chatard, of Baltimore, gave it in thirty-seven cases, and fourteen of them were still-births. Dr. Holcombe, of New Jersey, Dr. Davies, of London, Mr. T. Chavasse, of Birmingham, Mr. Paterson, of Aberdeen—all experienced obstetricians, coincide with the previous authors. Dr. Perkins, of this city, testifies: "I have reasons satisfactory to my own mind for believing, that it has frequently destroyed fœtuses, and produced sterility in mothers."

Dr. Beatty, of Dublin, states that he has known infants which have been narcotized by ergot before birth, to have been affected with convulsions afterward, *terminating in idiotcy!*

This is but a small part of the evidence extant, but I trust it is sufficient for a proper understanding of the subject.

Nor is the employment of chloroform, ether, or any other *unnatural* agent free from danger. These agents will, it is true, mitigate the suffering from labor pains to a much greater extent than they diminish the contractile power of the uterus. But already the attention of practitioners has been called to the injuriously narcotic effect of these articles on the child. And even in cases where it has not stupefied the child, it has produced a narcotic shock upon its nervous system which proved a lasting and incurable injury. If mothers will take proper care of themselves, there will be rarely occasion for such treatment; and if doctors would teach them this lesson, and so avoid the necessity of using those agents, they would confer on suffering humanity a much greater boon than in assuaging pains which might have been avoided.

Natural Labor.—All labors are usually called natural in which the child is so disposed within the uterus or pelvis that the birth can be accomplished by the efforts of nature; in contradistinction to *unnatural* and *complicated* labors, which require manual or instrumental assistance. In the most common, and perhaps the only truly natural labor, the head presents at the superior strait, with the occiput in front or toward the symphisis pubis, and the face turned toward the sacrum

The reversed presentation—the face forward—is rarely attended with any other difficulty than a more tedious delivery. Foot presentations almost always terminate naturally, and the same is true of breech presentations.

Diagnosis of Presentations.—The distinctive signs by which different parts of the body can be recognized at once, ought to be familiar not only to all midwives, but to all females who are liable to be called upon to assist in emergencies. The *head* may be readily known by its hardness and by the sutures and fontanelles; the *breech*, by its softness, the anus, os coccygis, the scrotum or vulva, and the cleft between the buttocks; the *knee*, by its rounded form, and by the condyles of the femur; the *foot*, by its long narrow form, its being at right angles with the leg, the narrow heel, and nearly equal length of the toes; the *elbow*, by the olecranon process, which renders the joint much sharper than the knee; and the *hand*, by its shortness, the unequal length of the fingers, and the divarication of the thumb.

Stages of Labor.—The *first stage* is usually reckoned that period in which the first *obstacle* to delivery is overcome, which consists in the dilation of the *cervix uteri*. In most cases, a pouch of the membranes, filled with liquor amnii, called "the bag of the waters," is pressed forward of the child's head, and serves as an equable wedge to effect the dilation in the easiest possible manner; but when the waters have been prematurely discharged, the child's head acts as a wedge, in which case there is considerable more suffering. In the *second stage* the second obstacle, which is the brim of the pelvis, is overcome; the head of the child is compressed, and, as it were, *molded* into a shape exactly adapted to the passage. When the due position of the head is attained, it advances with every pain, and recedes somewhat during their intervals until it arrives at the lower outlet. The obstacles here are the ligaments, muscles, cellular tissue, and perineum, which gradually yield as the head is repeatedly pressed against them, until the dilatation is sufficient to permit the head to pass, constituting the *third stage*, and completing the birth. The duration of natural labor varies from a few hours to several days. The average time is about twelve hours. In the *fourth* and last stage, the placenta is detached and expelled. It may occur in a few minutes after the delivery of the child, or not till a lapse of several hours. Its expulsion is attended by comparatively slight labor pains.

Position during Labor.—Since man-midwifery has been a trade

an immense amount of ridiculous parade and scientific barbarity has become fashionable on parturient occasions. It is quite customary to fix and fasten the patient in some awkward position for hours together, surrounded by some half a dozen female *helpers*, each one having some particular pushing, pulling, holding, or lifting duty to perform in the premises, while the doctor is fantastically and frightfully dressed, as if about to perform some terrible surgical operation. It is not strange that mothers, with a first child, are so often tormented or alarmed into diseases and accidents. In the cities, labor-chairs are common; but in the country the patient is commonly perched up on four chairs, tied together and covered by bedding, with four attendants supporting the four extremities—the husband bracing behind—the doctor conveniently disposed, and one or two extra attendants making themselves "generally useful" in preparing medicinal slops for the woman in travail, and *tea* for the party, as soon as the travail can be urged to a conclusion. All this is wrong.

The patient should walk, sit, or stand until she feels inclined, by the severity of the pains, or the local disturbance, to rest. She should then recline on a hard bed or mattrass. She may assume any position that she finds most comfortable. She may have the head high or low; lay on the right or left side, or back; or, for a change, rest on the knees, supporting the breast with pillows; or she may change from any one of these positions to either of the others as often as she pleases, and even get up and walk, if the labor is protracted, whenever she feels able and inclined to. There is no necessity for her being confined to a fixed position, and constantly attended upon, by the man or woman-midwife. Nay, such constant attention is invariably injurious.

Management during Labor.—So many erroneous notions are aoroad on this subject, that I can scarcely write a paragraph without crossing some professional error or non-professional whim. In a natural labor there is almost nothing to be done, and the principal duty of the physician is to keep the attendants from meddling. After an examination, to ascertain if the presentation is favorable or otherwise, the duty of the midwife and attendants is resolved into keeping the patient in a comfortable position on the bed, supporting her during the pain by making firm pressure with the hand upon the lower part of the back, whenever she desires it—assisting her to change position, and giving her a swallow of water occasionally, which should be the only food, drink, or medicine allowed.

Many abominable customs of "hastening the delivery," have had their day; and many doctors have acquired great celebrity for "deliv-

ering women" quickly; but al. people ought to be taught that all these things pertain either to rash measures or false pretences. It is a common, and, I believe, universal dogma among professional men-midwives, that the *perineum must be supported* by pressing against it externally, while the child's head presses against it internally. I know of no standard author who does not recommend this practice. Professor White, of Buffalo, not long since testified in a court of justice, that the *principal use* of the physician was to support the perineum during the passage of the child's head. Now, in opposition to all this high authority, I protest against this practice as not merely useless, but actually injurious. And against the *science* urged in favor of the practice, and the affidavit of Dr. White, I oppose the common sense, that the distended part is more likely to be injured or ruptured when pressed between two resisting bodies than when only pressed on one side. The practice I am controverting can only be predicated on the notion that nature has not constructed the parts on correct principles, or has not provided the necessary means to accomplish her own purposes.

Some authors recommend the nurse to press upon the uterus externally as the child is being born, with a view of loosening the afterbirth. This, too, had better be let alone. The umbilical cord is sometimes coiled around the child's neck; and, although it can be easily slipped off, it seldom does any harm.

When the head is very strongly pressed in the cavity of the pelvis, the integument of the scalp often forms a rather firm, circumscribed swelling; and probably no occurrence so trifling has ever occasioned so many serious alarms and accidents. It has been mistaken for an abnormal tumor, and cut open; and, for a presentation of some other portion of the body. No one, not even the most inexperienced, need make any mistake here if he or she will only employ the thinking faculties, for the *hair of the scalp* will in all cases determine its character; and all the treatment it requires is to be left to itself.

As soon as the child is born it will cry lustily, if healthy and vigorous, soon after which the umbilical cord may be tied and cut; but if the child does not cry, or appears apoplectic or feeble, the cord should not be cut until the pulsation in it ceases. Some authors have recommended slapping the child on the back to excite circulation and respiration; but a more merciful and more efficacious practice is to dash a little cold water on its chest, abdomen, and spine.

The cord may be tied about two inches from the navel, and again an inch farther off, and then cut through near the first ligature with a pair of scissors. Dr. Burke (*Accoucher's Vade-mecum*) tells us with be-

coming gravity, that "a piece of narrow, flat tape makes the best ligature;" but I cannot conceive any reason for selecting one kind of a string in preference to another; and, in fact, if the cord is not severed too soon, there is no real necessity for a ligature at all, as we may learn from the examples of the animals around us.

The After-Birth.—The contractions of the uterus, which expel the child, also detach the placenta; and in most cases it lies loose in the vagina after delivery of the child. Sometimes, however, it is not entirely detached, or is still attached to some portions of the uterus by morbid adhesions. If no expulsive efforts are made in an hour or two —evinced by a recurrence of bearing-down pains—the cord may be gently pulled upon—never forcibly; and if the after-birth does not readily follow, gentle pressure may be made on the lower part of the abdomen with the hand: or the abdomen manipulated from above downward. Should the placenta be retained several hours without expulsive pains, the hand may be dipped in cold water and applied as above, to excite uterine contraction. The sudden application of a cold wet cloth to the abdomen is often effectual. After the removal of the placenta, a free vaginal injection of cold water is always harmless, and generally remarkably soothing and strengthening.

After-Management.—Professors of midwifery instruct their pupils to conclude their duties in this matter by placing a bandage around the abdomen of the mother to prevent a "pendulous belly;" and another around the child to secure it against being "pot-bellied." All wrong again. They do not prevent such results. The most unshapely abdomens I have ever known occurred after severe bandaging. To the infant such an application is particularly cruel and barbarous. Its tender, flexible muscles cannot have too much freedom; and those men-midwife philosophers who imagine one portion of the body wants reforming by artificial supports, while all the rest is pretty well put together by Dame Nature, must have a very mean opinion of her handiwork, as well as an exalted estimation of their own superior skill and taste.

The wet and soiled clothing should be removed from the bed as soon as convenient, and the patient supplied with clean linen; after which she should be allowed to rest as long as she feels so inclined. A tepid sitz-bath or ablution may be advantageously taken after resting awhile. It is a great mistake that lying-in women should keep their rooms or beds any prescribed length of time. But, on the other hand, there is nothing gained in being too heroic. I have known females in

this city take the entire charge of their infants from the moment of birth, and leave their rooms comfortably on the day after delivery; but if all should attempt to do so some of them would most certainly have the experiment to regret. Whenever the patient feels faint or exhausted, she should be allowed the most perfect repose, until her sensations indicate exertion. If she has been subject to prolapsus, or severe leucorrhœa, she should be guarded against exerting herself too soon. The rule for her to be governed by is, to sit and walk as soon or as much as she can without inducing pain, distress, lameness, or bearing-down sensations—but not to transcend those limits—with no regard whatever to time.

Convalescence of Lying-in Women.—There is no place where more mischievous meddling with the harmonious operations of nature is found than in the chamber of the lying-in woman; nor is any place more abounding in mal-practice on the part of the physician; nor more infested with the conceits, whims, miseducation, prejudices, and superstitions of nurses. When the usual stimulating and slopping of the mother, and the stuffing and dosing of the child is taken into the account, we have no occasion to wonder that so many mothers have a "bad getting up," nor that so many children decline and die. The mother is gorged with catnip teas, panada, wine-whey, soups, broths, and medicated slops innumerable to promote the lochial discharge, or increase the secretion of milk; and the child is made to swallow castor-oil, sweetened urine, and other nauseous and disgusting trash, to "clear out the meconium," and afterward fed on magnesia, prepared chalk, and dosed with aromatic seeds and pungent essences to "keep out the wind," and paregoric or laudanum, or opiate cordials, to quiet the pain and irritation which the doctoring has produced. These doings, which are almost universal in civilized society, indicate a stupid ignorance or gross perversion of the simple and efficient operations of nature, destroy thousands upon thousands of infants in their cradles, and lay the foundation for debility, imperfect development, and innumerable diseases in those who are so fortunate or unfortunate as to survive them.

The food of the mother should be essentially of the same nature as usual, having reference, of course, to the state of the system, amount of exercise, etc. The mother does indeed, to some extent, "eat for two," but the appetite will always demand food enough; and it may be satisfied short of overloading or oppressing the stomach. Bread and milk, or gruel with toasted bread, cracked wheat, boiled rice, etc., with a moderate supply of ordinary fruits and vegetables, are suffi

ciently watery for all needful purposes if the milk be deficient, while dry toast, crackers, good bread, potatoes, etc., are amply corrective when the breasts are overburdened with this secretion.

Accidents during the Lying-in Period.—The majority of accidents and diseases which follow ordinary labors, are artificially produced, the result of meddlesome doctoring or bad nursing. The majority of medical writers on midwifery give directions for managing the patient, which, if strictly followed, could hardly fail to induce actual diseases. It is a common practice to stimulate with wine or brandy, or camphor and carbonate of ammonia, if the patient seems exhausted and chilly after parturition; give opium if she is restless, and bleed or leech if she is feverish, and take blood even if she is cold and shivering, if the practitioner *suspects* the shivering to be the cold stage of an approaching puerperal fever. Thus is the whole organism thrown into confusion and disorder, and called upon to waste its prostrated energies in resisting the effects of poisons at the precise moment when it needs the most profound and undisturbed repose, both as regards external disturbances and internal irritations. A single extract from a standard text-book will show that I neither misrepresent nor exaggerate in this matter.

Dr. Huston, as quoted by Dr. Condie, in Churchill's Midwifery, says: "I have seen more than one instance in which there was reason to believe the life of the patient was sacrificed from ignorance of the true character of the condition here referred to [nervous shock or exhaustion after delivery]. If the attention of the practitioner be at the time particularly directed to puerperal fever, he is liable to confound the exhaustion in which he finds the patient with the early stages of that disease. The cold extremities constitute the chill, while the haggard countenance, hurried respiration, and frequent pulse are regarded as conclusive evidence of a rapid peritonitis. Bleeding from the arm or by leeches, is the instant resort, and a few short hours confirm the worst anticipations, by the *fatal termination*, a result which the efforts of the attendant have but too successfully aided in producing."

Who can fail to see the "lesson of wisdom" taught by these fatal mistakes? Lancets and leeches have no business in the lying-in chamber; and if they were always where they should be no woman would be killed by them; the doctor might err in opinion without causing the death of his patient. And here I may pertinently state a rule of universal application, which doctors, midwives, and nurses might often revert to advantageously: Whenever there is serious doubt as to

what ought to be done for the patient—*do nothing*—ten chances to one that while the doubts are being solved, nature will solve the difficulty.

Flooding sometimes, though rarely, occurs several hours after delivery. It is to be treated precisely as when occurring at any other time.

The *lochial discharge*, or *flowing*, sometimes ceases suddenly, or is suppressed by taking cold, or by inflammatory excitement, followed by distress or swelling in the abdomen, or pain in the head, sense of numbness, coldness, etc. The warm hip-bath or hot fomentations are to be occasionally employed until the action is re-established.

Puerperal fever, or *peritonitis*, is one of the most frequent and fatal diseases under old school practice; but I have never known nor heard of it among several hundreds of cases treated hydropathically. In fact, I consider this frightful form of fever an *impossibility* under judicious water-treatment. Medical authors distinguish several varieties or forms of this disease, as *acute puerperal peritonitis*, *adynamic* or *malignant puerperal fever*, *puerperal intestinal irritation*, *false peritonitis*, etc.; but they are all merely accidental modifications or different degrees of severity of the same disease, which consists essentially in an inflammation of the peritoneal membrane, sometimes, however, complicated with inflammation of the bowels or uterus, and attended always with a violent but low prostrating fever of the typhoid type. Among the more prominent symptoms are swelled, hard, and painful abdomen, and obstinately constipated bowels.

There is no disease the pathology of which physicians confess themselves more ignorant of; and certainly there is none which has been more unfortunately treated by the medical faculty, the deaths averaging about one in three cases.

The treatment is the same as for ordinary inflammation of the bowels: cold wet cloths to the abdomen, the pack or general ablution, warm foot-baths, cold applications to the head, and tepid injections. There is no danger whatever in applying cold wet cloths to the abdomen in these cases: the danger is in withholding them. I have known too many to sink rapidly under the hot mustard plaster and turpentine treatment, not to speak advisedly on this point.

Inflammation of the breast, resulting in abscess or "broken breast," is among the frequent results of the system of living and doctoring we oppose, and among the things unknown in hydropathic practice. Cold wet cloths, well covered with dry ones, and very often renewed, constitute the local treatment. When the breast has a surplus quantity of milk it may be drawn off with the breast-pump, or by that ever-

convenient suction-pump, the human mouth. When the nipple is malformed or deficient, the breast-pump will often succeed in drawing it out.

It is no uncommon circumstance for a young mother, especially with her first child, to suffer horribly for three or six months, or even a year, with this loathsome complaint; and yet it can never occur if the system is kept free from obstruction by proper diet and bathing, and is not drugged.

Sore nipples require nothing more than a little cream, olive oil, or simple cerate, with the occasional application of cold wet cloths when they are hot or painful, and occasional fomentations when they are cracked and sore.

Milk fever, which is owing to an overheated or unventilated apartment, or to heating food, drinks, or medicines, usually appears about the third day after delivery. It is attended with the ordinary symptoms of general fever, great pain and throbbing in the head, and, unless speedily relieved, a suppression of the secretion of milk. If the patient is not very weak or exhausted, the wet-sheet pack should be promptly resorted to, and repeated as often as the general heat demands; otherwise, tepid ablutions are to be very frequently employed.

Puerperal swelled leg—phlegmasia dolens—is yet another frequent occurrence in ordinary practice, but unknown in the Water-Cure system. This malady has already been considered in the chapter on Dropsical Diseases; and I need only add in this place, that the management is the same as for local inflammations generally: cold wet cloths, according to the local heat, and cold or tepid sponging or washing of the whole body, according to the degree of general heat.

CHAPTER VII.

INFANT NURSING.

Dress of Infants.—The first provision to make for the new-born infant is suitable clothing. All the usual bandaging and swathing is to be rejected, with every other article of apparel that in the least constrains its motions. After a washing in tepid water, a soft rag should be tied around the remnant of the cord, and the child dressed with the diaper, a loose shirt, a soft flannel petticoat, and an easy frock. On no

account should any thing be pinned or tied around the abdomen, or any part of the body, like a belt or bandage, unless for some surgical purpose.

Bathing Infants.—Every child should be washed over the whole surface daily; always, too, immediately after waking from sleep, and never soon after eating. The water should be of a mild temperature at first—85° to 80°—and gradually reduced to 70° or 65°.

Food of Infants.—Greater errors are committed in this department of infantile nursing than in any other, unless it be in that of drugging. Indeed, I know of no subject in relation to which our American women are so ignorant, or, rather, so full of errors as this. The women of England are far more intelligent in the method of rearing children healthfully; and the animadversions of some of them upon the foolish habits which prevail in this country, of stuffing and gorging young children on complicated dishes, sweet cakes, candies, and the like, though very severe, are perfectly just. No American mother could be induced to feed her child in the way children are generally fed in this country, if she knew the consequences.

Not long since a gentleman and his wife, from a neighboring state, were under treatment at one of my establishments. A child happened to be present which had been thus far reared hydropathically, and was a perfect picture of health and happiness. During a conversation about this child, she went to her trunk, and then exhibited the daguerreotypes of three beautiful children she had lost. They were all fine, healthy children, and grew hopefully; but alas! at two, three, and four years of age they suddenly *died of convulsions!* After inquiring into her habits of feeding them, I could only wonder how they lived so long. Poor, childless mother! she still weeps for the lost ones; but I fear if others are born unto her, they will be lost in the same way, so difficult is it to teach a mother that *her* artificial appetite is no guide to the natural diet of a child.

The mother's milk, it is known, is the appropriate food during the first few months; but in cases where the breast does not yield a supply at first, a little sweetened milk and water is the best substitute. It must be remembered that, in the great majority of cases, the breast will yield the food as soon as there is any real necessity for it on the part of the child. Nurses generally commence giving solid food too soon—as early as the third or fourth month. The first appearance of the teeth, about the seventh month, seems to indicate that as the natural period for commencing the employment of solid food. It is a

great mistake to suppose that all the food taken into the tender and delicate stomach of the infant should be fine, concentrated, divested of all innutritious matter, and very nutritious. It is, on the contrary, even more important for children than for adults, that the food should be unconcentrated and unobstructing, as well as simple and uncomplicated. Farina, corn starch, fine flour, and refined sugar, are the fashionable materials for the infant dietary; but a worse selection could hardly be made. Graham flour, mush, cracked wheat, coarse Indian meal, hominy, boiled rice, brown bread soaked in milk, boiled potatoes, stewed squash or pumpkin, roasted, baked, stewed, or boiled apples, etc., are the proper solid food for infants from the first moment that they are able to take any kind. This plan of dieting will secure the child against dysentery, cholera infantum, colics, gripes, spasms, convulsions, scrofulous swellings, skin diseases, painful teething, etc., etc., which annually sweep off so many thousands to their graves.

Improper diet has a vast deal to do with making children cross, fretful, and ugly-tempered, as well as dull, sickly, and stupid. The most healthy children may be stuffed so outrageously as to suffer continually from cramps, colics, and all sorts of aches and pains; and so feeling bad, will act bad, in spite of good counsel, parental authority, the nurse's lullaby, or the barbarian's rod.

The practice of learning or forcing children to swallow flesh-meat, before they can properly masticate it, is deserving the severest reprehension. Scarcely any thing, in my humble judgment, has a more injurious effect upon its body or mind than this miserably foolish fashion. Two or three years is early enough, and several years later is still better, for any child to first taste of flesh. But many mothers, perhaps the majority, stuff fat, grease, and flesh into their mouths before they are even weaned. Such children are always full of foul humors, or liable to severe inflammatory or febrile diseases every time they take a little cold; all of which may be avoided by feeding the child on such plain, simple, vegetable food as it always relishes, and will always be satisfied with, until its parents or nurses, in their deep, dark, and pitiable ignorance, pervert and deprave its natural appetite.

After being weaned, the usual time of which is at the end of nine or ten months, the child should be trained to regularity in the habit of eating; never allowed to eat between meals, nor after going to bed at night, until the next morning's breakfast-time.

The practice of feeding children simply to amuse them or keep them quiet, is also deserving severe reprobation; yet it is one of the fashions of these days. Those who travel much on our railroads or steamboats will, if they are of observing habits, notice that a large

proportion of all the children aboard, from one year old upward, have their hands full of candies, sweet cakes, or some other eatable; and if their observing habits are close, they will also notice that those same children are crying, kicking, and yelling with teethache, headache, stomachache, and bellyache, a good portion of the time. If the mothers of those children understood the connection between these causes and effects, they certainly never would be the instruments of inflicting so much misery on their little ones.

Drink of Infants.—Few words are required here. Those children who are fed properly know very little of thirst, unless it is derived from the bad dietetic habits of the mother. Still, if thirst exist, water should be allowed *ad libitum;* but the greatest care should be taken to provide perfectly pure and soft water. Children are more injuriously affected than adults by impure or hard water. Salted or greasy food provokes excessive thirst in young children. Common bakers' bread induces great thirst in all children who are principally fed upon it—a conclusive evidence that it is not fit for them. Warm drinks, with which some nurses are so fond of slopping children, after provoking unnatural thirst by unnatural food or seasonings, tend to produce diseases and debility of the kidneys and urinary organs. It is an excellent practice to give the child a tea-spoonful of cold water two or three times a day, independent of its desire to drink. It soothes the irritability of the gums, and lessens the inflammation and tenderness during dentition.

Sleep of Infants.—Young infants are naturally disposed to sleep a large proportion of the time—an instinct which may be indulged to its full extent. It is essential, however, to the health and perfect development of the young child that it does not sleep with a sickly or aged person; and it is preferable to have it sleep in a crib or trundle-bed by itself, in all cases after weaning. The thorough ventilation of a child's sleeping apartment is even more important than that of the adult. Children do not often take cold from excess of air while asleep, but very frequently in consequence of sleeping in a hot or close room.

Exercise of Children.—Young children, if healthy, are always in motion, except when asleep; and those mothers do them wrong who try to keep them still and out of mischief. The true philosophy of *babyism* is to keep mischief out of their way, and then let them run. They must exercise in play constantly, or be sick. A lazy or a quiet child is a sick one.

Excretions of Infants.—Nothing can exceed the absurdity of the common practice of dosing a young child, on every occasion of a little irregularity of the stomach and bowels. In most instances those disturbances are salutary efforts of nature to get rid of surplus, crude, or irritating matters. The conical shape of the infant's stomach enables it to vomit with great facility; and in most cases the vomiting is the result of overfeeding, or offending material. In either case it will take care of itself if left to itself, and nothing put into it but proper food and drink in proper quantities.

The bowels are necessarily subject to some degree of irregularity. For a few days after birth the discharges will be dark and watery, consisting of the fœcal matters, or *meconium*, which accumulate in the bowels during the latter part of the fœtal life, mixed with the ordinary fœcal excrement and secretion; gradually they become more yellow and of firmer consistence. When the teeth are pressing through the gums, the bowels are always naturally prone to laxness; and if the irritation from teething is considerable, the looseness will amount to diarrhea. Here again, if we are not too blind, we may see the beneficent provision of nature to remedy what seems to us to be abnormities. If the child is properly fed, no trouble need be apprehended from this source—the bowels will take care of themselves. In extreme cases of irregularity, either of diarrhea or constipation, no other medication is necessary than cool injections, with the wet abdominal bandage in the former case, and tepid injections, and perhaps a greater proportion of fruit, in the latter difficulty. The ideas of curing diarrhea in young persons by astringent medicines and constipating food, and constipation by purgatives, are both exceedingly mischievous in practice. Both complaints arise from irritation or debility, and healthful action is the proximate remedy for both.

Teething.—The lax state of the bowels lessens, to a considerable extent, the inflammatory state of the gums during the protrusion of the teeth. The irritation can be further allayed by occasionally putting a tea-spoonful of cold water into the mouth. When the teeth are about coming through, rubbing the swelled gum with the finger is extremely soothing; when there is great heat and tenderness, a piece of ice inclosed in a rag and rubbed on the gums will alleviate the pain. Children often manifest, for a few hours, a high constitutional fever, the result of the local irritation. Beware of meddling with this fever in the way of drug-medicines, as an inflammation of the bowels may be the consequence. I protest also against the common practice of cutting or lancing the gums of children. Serious evils often result

from it, and all the good it promises can be assured by the other means I have mentioned.

Drugging Infants.—From a little book (*Essays on Infant Therapeutics*), by the late John B. Beck, M.D., Professor of Materia Medica and Medical Jurisprudence in the College of Physicians and Surgeons of the University of the State of New York; Corresponding Member of the Royal Academy of Medicine of Paris; Corresponding Member of the Medical Society of London; one of the Vice-presidents of the Academy of Medicine of New York, etc.—these titles show that this book is one of *authority*—I copy the following statements:

"With regard to the effects of opium on young subjects, there are two facts which seem to be well established. The *first* is, that it acts with much *greater energy* on the infant than it does on the adult; the *second* is, that it is more *uncertain* in its action on the infant than the adult. It is in consequence of these peculiarities attending its operation on the infant, that even the *smallest quantities* have not unfrequently produced the most unexpected and even *fatal results*." Of this, almost *every physician* must have seen some melancholy examples. Dr. John Clarke states that half a drachm of sirup of white poppies, and also a few drops of Dalby's carminative, have proved fatal in a few hours. Mr. Marley knew a case in which half a small tea-spoonful of sirup of poppies proved nearly fatal, and one case in which thirty-five drops of Dalby's carminative proved quickly fatal to a young child. Dr. Bard knew an infant of several months old killed by ten drops of laudanum, and another nearly killed by less than two drops. Dr. Christison states that three drops of laudanum in a chalk mixture for diarrhea, killed a stout child, fourteen months old, in six hours. Dr. Ryan has known one drop of the "sedative liquor of opium" narcotize an infant. Pereira has seen a powerful effect produced on an infant by one drop of laudanum. The London Medical Gazette states that two drops of laudanum, and in one case one drop, resulted in the death of the infant.

In the Southern Medical and Surgical Journal for July, 1849, the following case was reported by Dr N. V. Woolen, Loundesboro', Alabama: "A fine, healthy female child, in the fifth day of its age, suffered from 'griping,' as its mother supposed, for which she administered to it *one* drop of laudanum. Thirty minutes afterward its breathing became slow and stertorous, and other symptoms of narcosis came on. Notwithstanding every effort made, the child died in eleven hours after."

If so many children die from the effects of such small doses, how ruinous must be its common administration by the hands of nurses on any occasion when the child is uneasy, or refuses to keep as still as suits their comfort and convenience. It is an ingredient in most of our medicated candies and lozenges, cough-drops, soothing sirups, cordials, carminatives, nervines, etc. Dr. Beck says: "The effect is to stunt the growth of the child; it is emaciated and puny; the skin is flabby and shriveled; the lips are bloated, and the countenance sallow and wrinkled. There is an absence of all intelligence, and the whole appearance is haggard and aged, presenting a sort of 'miniature of old age.'"

Now, as antimonial preparations are among the medicines which are freely given to children, and which enter into a great variety of fever, cough, emetic, and cathartic mixtures, and are even one of the medicating ingredients of candies, lozenges, and sirups, it behooves the people to know something about them. In the work above quoted, Dr. Beck tells us that he has known one thirtieth of a grain of tartar emetic endanger the life of a child one year old; and in another case a child was killed by *small doses* of the article. Dr. Clarke, of London, states that a quarter of a grain of tartrate of antimony in solution has produced the death of a young child. Dr. Hamilton testifies that alarming convulsions have followed its use. Mr. Noble, of Manchester, England, and Mr. Wilton, surgeon to the Gloucester Infirmary, report several cases of children of one to four years of age, dying from taking the common antimonial wine for ordinary cough and cold. Dr. Armstrong has many times seen delirium produced in young children by very small doses of antimonial preparations. Professor Schæpf Merei, of the Children's Hospital in Pesth, Germany, certifies that he has known several children vomited and purged to death by very small doses of tartar emetic. Dr. M'Cready, of this city, reports a death from the article administered in the form of Coxe's hive sirup.

Dr. Beck says: "The vomiting induced by the preparations of antimony ought to be resorted to with great caution in very young children, and should never be used except in those cases where a sedative effect is required, and can be borne with safety." The rule stands self-stultified, for the frequent deaths resulting from its use in the hands of the experienced physician, show that no medical man on earth can ever know that it can be "borne with safety."

Mercurial medicines, in a variety of disguised forms, are more frequently taken into infants' stomachs than most people are aware of. Dr. Beck tells us that their action is more energetic in the infant than the adult, and that when salivation takes place its effects are most disastrous. "Sloughing of the gums and cheek," says Dr. Beck "gen-

eral prostration and death, are by no means uncommon occurrences." Dr. West (*Diseases of Infancy and Childhood*) has known fatal gangrene of the cheek, and necrosis of the jaw, to result. M. Bedingfield states (*Compend of Practice*), that he has known the parotid glands both ulcerated and entirely destroyed by mercurial action in young children. Dr. Beck expresses the opinion that the practice of giving calomel as an ordinary purge to children, because of the facility with which it can be taken and retained, *has laid the foundation for the ruin of the constitutions of thousands.*

I could extend these quotations indefinitely; but my purpose is to exhibit a reason why the whole trade of drugs should be rejected from the nursery at once and forever; and if the testimony already presented, which the reader will bear in mind is all taken from standard authorities of the school which advocates the practice I am opposing, is not conclusive, neither would people believe though all their children should die under their own eyes. The little good that these execrable poisons *seem* to do in some cases, is counterbalanced a thousand fold by the certain injury. Besides, and more than all, there is never—I say emphatically *never*—any necessity for their employment. There is no conceivable disease, state, condition, or ailment for which there is not a surer, safer, better way.

Infantile Diseases.—A multitude of small books have been written on diseases of small children, in most of which the matter is treated as though it was as natural for babies to be sick as it was to breathe. Gum rashes, gripings, spasms, fits, running at the ears, thrush, aptha or canker, inflamed gums, etc., are usually regarded by this class of writers as things to be expected, and provided for by keeping a due assortment of medicines on hand. I need not waste time in exposing the absurdity of all this, which is self-evident to all who will take the trouble to think for themselves. The mother who chooses to rear her children according to the principles advocated in this work, will have little to do with "infantile diseases." And if she chooses to throw the responsibility of the health and well-being of her offspring upon the doctor, I can only pity *them*, and pray for *her* enlightenment.

CHAPTER VIII.

COMPLICATED LABORS.

Tedious or Protracted Labors.—These result from a variety of causes, the principal of which are debility of the muscular fibers of the uterus; obliquity of the uterus; premature escape of the liquor amnii; excess of the waters of the amnion; unusual toughness of the membranes; and rigidity of the os uteri. In nearly all these cases, however, nature is competent to accomplish her work without our interference; and our main duty is therefore to exercise patience, and encourage the patient to do the same. In some few instances manual and medical assistance may be rendered. When the membranes protrude externally during several pains, they may be ruptured with the finger, and the waters discharged, after which the labor will be rapidly finished. Females who have suffered much from leucorrhœa or prolapsus, are liable to a thickening of the mouth of the womb, rendering it undilatable, or, rather, causing its dilatation to be unusually slow and painful. An occasional warm hip-bath will materially add to the comfort of the patient.

Preternatural Presentations.—The statistics of over 300,000 cases, collected by various European practitioners, show that breech presentations occur once in about 53 cases, and footlings once in about 90 cases. In 78,027 cases, 1,277 were breech presentations; 1,019 presentations of the inferior extremities; and in 293 cases the superior extremities presented. From these data we may see how rarely is there occasion for instrumental or manual interference, even under the present disease-producing habits of the civilized world.

In the great majority of these preternatural presentations, the labor can be accomplished by the efforts of nature alone. Those which most frequently require assistance are presentations of the superior extremities. The general remedy in all these cases is *version*, or *turning*, except in cases of badly-deformed pelvis, or enlargement, or some other deformity of the child, when evisceration may have to be resorted to, or, as a preventive measure, premature labor induced.

Operations in Midwifery.—The operations in complicated cases

of midwifery which are considered as regular, are turning, the induction of premature labor, the lever, the forceps, craniotomy, and hysterotomy.

Turning, or *version*, consists, whatever may be the part presenting, in bringing forward the feet, this converting the case into a footling. The statistics of English, French, and German practice together show that the operation has been performed once in about 120 cases. In English practice alone it was performed but once in over 250 cases. It is sometimes resorted to in cases of convulsions, flooding, prolapsed cord, etc., in order to terminate the labor sooner. It is generally proper and often indispensable in presentations of the superior extremities or trunk, and in presentations of the placenta, which are attended with alarming flooding.

In performing this operation, the hand is introduced very gradually during the intervals of the pains, the fingers being kept in a conical form, following the curve of the pelvic passage, until the fingers and hand are gently insinuated through the os uteri, and through the membranes, if they have not been ruptured. If the shoulder present, it can then be pushed upward, and the head brought down to the oblique diameter of the brim of the pelvis, and the labor thus left to the efforts of nature. If the case is an arm presentation, the hand is to be passed along the arm until it reaches the body, then passed over the *front* of the chest and abdomen to the feet. After one or both lower extremities are reached, the feet are to be brought, with a gentle, waving motion, to the pelvis, during the intervals of the pains, which accomplishes the turning; after which the labor is finished as an original footling presentation. The feet, in turning, are to be brought over the *front* of the child, and as the feet are drawn down, the misplaced hand or arm will ascend. The labor will then be concluded without further assistance in most cases; but if the patient be in a state of extreme exhaustion, it is proper to exert a moderate extracting force upon the feet *during the pains*.

The proper time for commencing the process is as soon after a sufficient dilatation of the os uteri as possible. As preparatory measures, the bladder and rectum should always be emptied. Madame Bouvin performed this operation 218 times, with a loss of 48 children.

Premature labor may be justifiably induced in such known deformities of the pelvis as will not admit of the delivery of the child at the full period. The operation has been very rarely undertaken by regular physicians in any country; and the results, as far as statistics have been gathered, show that about half the children survive, while the mortality of the mothers is about one death in ten cases. No less

than six different methods of exciting prematurely the uterine contractions have been advocated, the most effective of which are puncturing the membranes, or mechanical dilatation of the os uteri. Uterine action usually comes on in one, two, three, or four days, and the patient requires the same management as in ordinary labors.

The *lever*, or *vectis*, is not frequently employed in midwifery, yet, more frequently than it should be. Its first introduction into practice was "hailed as a discovery calculated to confer immense benefit upon the human race;" but, like many other pretentious affairs, its reputation soon began to wane. Its use is said to be, "to correct malpositions, or aid the natural motions of the head at the brim or in the cavity of the pelvis." My own opinion of the instrument is, that it ought to be excluded from midwifery practice altogether.

The *forceps* is employed rather frequently, and has been in use about two centuries. It is undoubtedly a valuable contrivance for certain morbid conditions and abnormities. Its object is to grasp and compress the head of the child, and it can be then used as a lever or extractor. Authors specify a great variety of conditions and circumstances to which they are applicable; but in my judgment their proper employment is limited to cases in which uterine contractions fail from absolute exhaustion of the patient; in cases of convulsions, hemorrhage, or rupture of the uterus, demanding an immediate conclusion of the labor, in order to save the life of the patient; and in cases of breech presentation, when the head is retained a long time from incompressibility of the base of the skull. In Dublin, Dr. Clarke used the forceps once in 728 labors; in Paris, Madame Lachapelle once in 293 labors; in Berlin, Dr. Klugè once in 16 labors; and Dr. Siebold, of Berlin, used them once in 7 labors. These figures show that they are employed more according to the fancy of the practitioners, than from the real necessities of the cases.

Craniotomy, which consists in opening the head of the child, and evacuating the contents of the cranium, is employed when there is too great disproportion between the size of the fœtal head and the pelvis to permit the passage of the former, as in the case of deformed pelvis or dropsy of the head; also, when the child has been dead for some time without the labor progressing; also, when, from disease or accident, the head has been separated from the body; and, finally, when the passage is obstructed by immovable tumors.

There is another complication which requires this operation as the only chance for the mother; and although I do not find a similar case mentioned in any of the books, an instance occurred a few years ago in my own practice. It was a case of twins, one of which was a foot,

and the other a head presentation. The difficulty consisted in the heads, both of which were small, being locked in the pelvic cavity; the head of the footling remaining fastened *back of* the head of the other I did not see the patient until the labor was too far advanced to remedy the malpositions, and hence was obliged to eviscerate both heads before either could advance.

From the statistics of over three hundred thousand cases, it appears that this operation has been resorted to once in about eight hundred labors. Of course, in those cases where the child is not dead, the operation contemplates a sacrifice of its life to save that of the mother; as, otherwise, both would inevitably perish

A great variety of instruments have been invented for this operation The *perforator* is commonly employed to open the cranium, and then the *crotchet*, or cranial hook, to extract the fœtus. A pair of long-pointed scissors, or a scalpel with the edge wound to very near the point, will answer. The principal point of skill consists in keeping the point of the instrument exactly in position during the operation, and avoiding injury to the surrounding parts. When the os uteri is well dilated, the fingers may be employed as tractors more advantageously than any other instrument.

Embryotomy is a modification of craniotomy; it consists in dissecting the trunk and limbs, and bringing the fœtus away in fragments, in those cases of cross presentations of the trunk or superior extremities in which the body is immovably fixed in the cavity of the pelvis, and in cases of deformities or monstrosities of the fœtus.

Hysterotomy, or the *Cæsarean section*—as it is called after Claudius Cæsar, who has the reputation of being the first who came into the world in this way—consists in making an incision through the abdominal walls and the uterus, removing the fœtus and placenta, and then dressing the external wound by sutures and adhesive plaster. It is the dernier resort, and only justifiable when distortion or obstructions render all other methods unavailable. In British and American practice rather more than half the mothers operated upon have been lost.

Symphyseotomy, or a division of the bones at the symphisis pubis, was proposed as a substitute for the Cæsarean operation by Sigault, who experimented in this way at Paris in 1777; and notwithstanding he was voted a medal and a pension, the operation soon fell into disrepute, for the very good reason assigned by Dr. Hull, "every operation had its victim." I am not aware that any among the living authors justify the operation under any circumstances.

FACE PRESENTATIONS.—The face may present in either of two po-

sitions, as the forehead is toward the right or left acetabulum. The presenting part is known by the general inequalities of the surface or by the recognition of distinctive parts, as the eyes, nose, mouth, or chin. After the labor is somewhat advanced, a swelling of the face may make it liable to be mistaken for a breech presentation. The bridge of the nose is here the best guide, presenting, as it does, a firm, sharp prominence unlike any other part.

These cases do not necessarily require assistance. The labor is more prolonged and tedious, and the child's head is often considerably bruised and tumefied, but seldom dangerously so. Patience is here the best doctor. The tables collected in the books show that this form of presentation occurs once in two or three hundred cases.

Breech Presentations.—In all these cases, as the child enters the cavity of the pelvis, its back is turned either anteriorly or posteriorly toward the symphisis pubis or sacrum. They occur, on an average, as appears from the statistical data, once in fifty or sixty cases. They may be distinguished from shoulder presentations by the movable coccyx. The labor is not as tedious as in the preceding presentation, and is rarely dangerous to the mother, although it is hazardous to the child, more than one fourth of those born in this way having been lost. The duty of the midwife or attendant in these cases is well stated by Dr. Churchill: "As to the actual management, the less interference the better for the patient." Dr. Collins, another experienced practitioner, remarks to the same effect: "The most common and dangerous error committed by the medical attendant arises from officious and injudicious attempts to hasten or assist during the early stages of labor, than which we could not well adopt a more hazardous course."

Foot and Knee Presentations.—Experience shows that the inferior extremities present but once in about a hundred cases. The mortality among children has been somewhat greater than in breech presentations, although the danger to the mother is no more. When the feet present, the toes may point forward or backward, and one or both feet may be advanced. In knee presentations, this part is liable to be mistaken for the elbow; it may be distinguished by its two prominences, with a depression between them.

In these cases, according to the admissions of the most experienced writers, it is even more important that the labor be let alone or left to itself than in either of the preceding varieties of malposition.

Presentation of the Superior Extremities.—In nearly all of

these cases the shoulder is the part primarily presenting, but afterward the arm prolapses; the back of the child may be turned toward the abdomen or spine of the mother, the former being the most common occurrence. In some of the instances of this presentation the labor has been accomplished without assistance, but in others this is impracticable. Its frequency has been one case in two or three hundred. Its danger may be judged of by the facts that, of the cases recorded, rather more than one half of the children were lost, and one in nine of the mothers. The diagnosis is difficult or impossible in the early stages. When the bag of the membranes protrudes in a conical or elongated form without inclosing the head, a suspicion may be justly entertained; and after the labor has progressed somewhat, the axilla may be found, which, with the round prominence of the shoulder, will convert the suspicion into certainty.

Turning is the proper resort in all these cases, and the best time to commence the operation is, as soon as the os uteri is as fully dilated as possible. There is no danger in waiting so long as the liquor amnii has not escaped; nor is there much difficulty in turning in this case; but the difficulty is greatly increased afterward by the firm and more constant contractions of the uterus. If the contractions are intense, turning will be impossible, and the attempt then would endanger the rupture of the uterus. In this case the whole abdomen should be fomented with warm wet clothes to relax the muscular system and lessen the contractions; and the patient should drink warm water to the extent of nausea to aid in suspending the pains, after which the operation may be undertaken. Should all these measures fail, and turning prove impracticable, the only remedy is evisceration of the thorax.

Compound Presentations.—In some rare cases, the hand or arm presents with the head, rendering the labor more difficult, but not necessarily dangerous. If discovered early, the arm may be replaced above the head; but great care must be taken not to draw down the arm, as this procedure would convert the case into an arm presentation. If the replacement is not practicable it must be treated as an ordinary labor.

The feet and hands may present together, or one of each, attended usually with prolapsus of the cord. As the labor progresses, one or the other extremity will descend, converting it into a footling or an arm presentation. By drawing down the feet, the most favorable position is secured; and this, if done gently and skillfully, can always be done safely; the attendant should be especially careful not to mistake a hand

for a foot, nor in any way maneuver so as to favor the descent of the hand or arm.

Plural Births.—The signs which denote twin pregnancy are extremely dubious. Each child has a separate placenta, and its special envelopes, and both are almost always smaller than usual. The labor may be in all respects natural in relation to both, or preternatural; or one may present a natural and the other an abnormal labor. Hence all the directions mentioned for single labors are applicable to twins triplets, etc. As many as *five* children have been born at one time, and four have been born alive. Statistics make the proportion of twins as rather above one in a hundred; and of triplets, one case in five or six thousand.

After the birth of the first child there is an interval of rest, varying from a few minutes to several hours; in some instances, several weeks have intervened between the birth of the first and second child. In the majority of cases, however, the expulsive efforts of the uterus are resumed in less than half an hour. If the placenta of the first child is not easily removable, it should be left until after the delivery of the second one; and the same rule applies to triplet and quadruplet cases.

Monsters.—In all of these cases there is excessive or defective development of some part or parts of the fœtus, or two fœtuses are conjoined. The only practical point relates to the obstacle which their bulk furnishes to the accomplishment of the labor; and here, when the deformity or monstrosity is too great to allow its passage, embryotomy is the necessary and only resort. In some cases of double monsters, as the Siamese twins, both have been born alive. The principal diseases which produce such morbid enlargements as to render the child disproportionate to the natural passages are, dropsy of the belly, and dropsy of the head—*ascites* and *hydrocephalus*. In the former cases, after the expulsion of the head, it will readily be discovered that the distention of the abdomen prevents the delivery of the body; and in the latter case the head is presented at the brim of the pelvis of unusual size and nearly incompressible; and, notwithstanding strong uterine contractions, or "good pains," the head does not descend into the pelvic cavity. In either case the child is either dead or in a dying condition; there need be no hesitancy in eviscerating or puncturing the abdomen or the head. In footling cases of hydrocephalus, the head is to be perforated behind the ears.

Prolapsed Cord.—The umbilical cord may protrude alone, or with

the presenting part, either at the commencement or during the course of labor. This accident has no influence on the labor, but endangers the child, by obstructing the circulation of the cord. Statistics indicate its occurrence once in about two hundred and fifty cases, with the loss of about half the children. A great variety of plans have been suggested, and many of them tried to remedy this difficulty; but some of them are hazardous to both mother and child, and all uncertain; my own opinion is decidedly in favor of the let-alone practice in preference to any thing yet proposed. In this way the mother's life will never be endangered, while the chances for the child are scarcely lessened.

Retained Placenta.—Obstetricians differ as to the time a retained placenta should be left to the efforts of nature before proceeding to extract it by force. Some are for waiting only an hour; others several hours; and others still oppose its forcible extraction at any time except when hemorrhage attends. It is certain that it will slough off and be expelled sooner or later, but practitioners have generally apprehended dangerous inflammation. Under the ordinary practice, there is very great danger in this respect; but with a more rational philosophy, and more efficient appliances to keep down inflammation, the hydropath can justly exercise greater hope in his own resources, as well as greater faith in nature.

The irregular contraction, or "hour-glass contraction" of the uterus, by which the placenta is retained, has been noticed frequently to follow the use of ergot, and sometimes the employment of instruments.

Hemorrhage.—Flooding, accompanying labor abortion, has already been considered. During the last month of gestation, at the commencement of labor, two forms of hemorrhage are liable to occur; one is called *accidental* because it arises from an accidental and partial separation of the placenta while occupying its usual situation; the other is termed *unavoidable*, because the placenta is placed over the os uteri and unavoidably separated as the dilatation progresses. Hemorrhage from these sources, according to the statistics, occurs once in about one hundred and fifty cases. In the first variety, the discharge occurs *only between the pains;* whereas, in the second variety, it is increased *during the pains*, yet continues also during their intervals.

When the hemorrhage occurs before expulsive contraction takes place in the uterus, the ordinary measures to correct it should be resorted to, as the horizontal posture, a cool room, hard bed, cold water-drinking, and cold enemata, to which may be added, in severe cases, the *tampon* of two silk handkerchiefs. When the full term of gesta-

tion has arrived, and actual labor pains have commenced, the operation of turning should be resorted to as soon as the os uteri is sufficiently dilated, providing the hemorrhage continues dangerously alarming.

Convulsions.—Convulsions of the *hysteric*, *epileptic*, or *apoplectic* character, are among the incidents of complex labors noticed by authors. They may occur previous to, during, or after parturition. Epileptic convulsions are much more frequent than either of the other kinds; and among all the cases recorded, only one in about six hundred have been affected with either kind. When the fits occur during labor, the uterine contractions are seldom interrupted by them.

Writers on midwifery are very contradictory as to the proper treatment to be pursued in these cases. The majority insist on large and repeated bleedings and strong purgatives; others add to this leeches, cupping, and blisters; and others add to them all opium and tartar emetic. Dr. Huston testifies that he tried the bleeding practice in one case, and the patient had a tedious recovery. In the next case, he tried an exactly opposite method—gentle stimulants—and the patient did much better. His experience strikingly illustrates the benefit of "choosing the least of two evils."

The general plan of treatment for these fits is precisely the same as when they occur at other times: warm hip and foot baths, cold applications to the head, etc.

Puerperal Mania.—Temporary delirium, or mania, often accompanies the latter stage of labor. It is manifested by incoherence of language, and appears to be occasioned by the extreme suffering experienced at that time by very irritable and nervous females. It generally passes off as soon as the labor is finished, and the patient has become partially composed. In some cases it results from an accidental suppression of the lochial discharge; and occasionally it seems to result from the irritation attending the lacteal secretion. As it is always symptomatic, attention is only required to the primary difficulty.

Lacerations.—Rupture of the uterus, or vagina, and lacerations of the perineum, are fortunately among the extremely rare complications. They may result from disease of the parts, producing a softening of the structures or obstruction of the passages, from the injudicious use of instruments, or improper interference with natural labors. It is only necessary to say, in relation to all these accidents, that they require the attention of the experienced surgeon.

Inversion.—An inversion of the uterus may result from a forced or too quick delivery, pulling upon the umbilical cord, preternatural attachment of the placenta to its fundus, or a tumor adherent to its fundus. It is denoted by the external protrusion, and the absence of the contracted uterus in the lower part of the abdomen. There is generally considerable hemorrhage, and the patient always becomes suddenly deadly pale, faint, and sick at the stomach; the voice is weak, the pulse rapid and fluttering, and immediate dissolution sometimes takes place.

In all cases, whether the inversion be partial or complete, its reduction should be attempted at once, by pressing the protruded portion gently, but firmly, up through the vaginal passage. Its complete replacement will be known by its suddenly springing from the hand, after it has been nearly restored to its position.

When the placenta is still attached to the uterus, authors are divided in opinion whether it should be removed prior or subsequent to the replacement. The best rule appears to me to be this: if the attempt can be made *immediately* after the accident, not to wait to remove the placenta; but if a considerable time has elapsed, the contraction will probably make its removal indispensable to success, so that the safer way is then to remove it before any attempt at reduction.

APPENDIX.

THE following paragraph, having been accidentally omitted in its proper place, must form an appendix to, and the conclusion of this work:

THEORY OF CONCEPTION.—The researches of naturalists and physiologists during the last hundred years, together with extensive observations and experiments which have recently been made, in relation to the reproductive function, have established a fact of immense importance to physiological improvement and human happiness. It has been demonstrated that procreation in the human animal is effected—as in all mammifers, as well as with birds and reptiles—by the development of germs, ovules, or eggs in the female, and their fecundation by the male. These ovules are formed in the ovaries, and are passed to the uterus, and thence expelled independently of fecundation or sexual intercourse. During each menstrual period an ova is transmitted to the uterus, where it remains several days, varying in time usually from one to two weeks, though, in a majority of cases, it is passed off between seven and twelve days. But if, before its expulsion, it become impregnated by sexual connection, it remains and becomes the embryon of the future being. Now, a knowledge of this law of conception places the existence of offspring, and the future population of the earth, entirely within the control of the will, reason, and judgment, instead of leaving them, as heretofore, at the mercy of a blind impulse or merciless passion. A thousand reasons will occur to any reflecting mind why, in certain places and under certain circumstances, a less numerous but better quality of infantile population is desirable. There are also thousands of married persons in the world, whose circumstances of extreme indigence render many children a source of regret to the parents and misery to the offspring; and, again, there are thousands of infirm, crippled, deformed, imbecile, or incurably diseased persons, living in the matrimonial relation, who are capable of propagating an inferior race, but who ought not to be cursing and cursed with offspring at all; and, lastly, under the forcing, stimulating, disorderly physiological habits of the vast majority of civilized people, there is a tendency to numerical increase, with corresponding imperfection of offspring. Against all these accidents and incidents, a knowledge of the origin of life affords us the remedy. And who shall say that a knowledge of the origin of life is not as legitimately to be sought and understood as a knowledge of the growth, development, education, and preservation of it? It is true that, in some few instances, the ova is expelled in two or three days after the cessation of menstruation; and in some rare cases

it does not pass off until after the twelfth day; but these are only exceptions to a general rule; and as impregnation can only occur, as a general rule, between the commencement of the menstrual excitement and twelve days after its cessation, those who would not propagate have only to abstain from sexual connection during this period. I am aware that some may object, as others have objected, to enlightening the general mind on this matter; that many persons, dreading the cares, expenses, trials, etc., of a family will abuse the privilege it confers, and refuse to bear their share of the burdens of furnishing the world with inhabitants, and the state with taxable citizens and numbers for the census. But I have no sympathy with the advocate for ignorance in relation to this or any other physiological law ordained for man's government. If God has made the law, it is man's privilege to learn it, and his duty to obey it; and, further, if there are such persons in existence as the objection supposes, they are themselves the strongest argument I can adduce in favor of my position. They should never be parents.

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